BULLETIN

OF THE

MADRAS GOVERNMENT MUSEUM

EDITED BY THE SUPERINTENDENT

THE CIRRIPEDIA OF THE MADRAS COAST

BY
A. DANIEL, M.SC.,
University Zoological Research Laboratory, Madras

NEW SERIES—*Natural History Section, Vol. VI, No. 2*

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THE CIRRIPEDIA OF THE MADRAS COAST

By A. Daniel, M.Sc.

INTRODUCTION

Indian Cirripedia have received scientific notice only recently. Subsequent to the brief reference, Darwin (1854), made to two species of the genus *Balanus* from the mouth of the Indus river and three othess from Tuticorin, South India; Weltner in 1894 and Borradaile in 1903, described eighteen species of this group, from collections made in the Indian Ocean and in the Maldive and Laccadive Archipelagoes. The most important contribution to our knowledge of the Cirripedes of India is that of Annandale (1905–1924) who described in a series of papers the Cirripedes in the Indian Museum collected from Ceylon, Indian and Andaman seas. Gruvel (1907) described the operculate barnacles of the Indian Museum.

Later in 1927, Sundara Raj recorded five species of Cirripedes from the Krusadai Islands and Nilsson Cantell (1938) made a complete study of the collections made from the Bay of Bengal, Arabian and Indian Oceans including thirteen species of Operculate barnacles from Madras.

Except for this account of Nilsson-Cantell and brief references of *Conchoderma virgatum* off the coast of Madras (Annandale, 1909) and *Balanus amphitrite* at Adyar in Madras (Panikkar and Aiyar, 1937) the Cirripedes of Madras Coast have received very little attention. Hence a detailed study like the present investigation was considered worthwhile.

MATERIAL AND METHODS.

The majority of the Pedunculate Cirripedes described here were found attached to the gills and externals of large decapod crustacea and the scales of sea-snakes, etc., some to floating timber, but the Operculate Cirripedes were collected from rocks, piers, buoys, etc., from different localities—Porto Novo, Tuticorin, Mahabalipuram, Krusadai Islands and Madras. Eight species were obtained by dredging along the coast on over forty different occasions, off Madras in the five-fathom line with a sandy substratum. Found together along with them were Amphioxus, Polychaetes, Copepods, Ophiuroids and Gastropods characteristic of the sandy substratum.

The valves and compartments of the specimens were isolated from the soft parts, immersed for ten minutes in caustic potash and cleaned to free them of adherent tissues. In most of the cases all the appendages were drawn from the same specimen, dissecting it under a binocular microscope and mounting the appendages each on a separate slide.

Borax carmine was used to stain the appendages. All the diagrams of the appendages were drawn with the aid of a camera lucida. Pilsbry's (1916) classification is followed in this paper.

A CLASSIFIED LIST OF THE CIRRIPEDES OF THE MADRAS COAST.

Sub-order **Lepadomorpha.**
Family **Scalpellidae.**
Genus **Pollicipes** Leach, 1817.

1. **Pollicipes polymerus madrasensis** Daniel, 1953.

Genus **Smilium** Broch, 1922.

2. **Smilium squamuliferum** Weltner, 1894.

Family **Iblidae.**
Genus **Ibla** Leach, 1825.

3. **Ibla cumingi** Darwin, 1851.

Family **Lepadidae.**
Genus **Lepas,** Linné.

4. **Lepas anatifera indica** Annandale, 1909.
5. **Lepas anserifera** Linné, 1761.
6. **Lepas pectinata** Spengler, 1793.
7. **Lepas bengalensis** Daniel, 1952.

Genus **Conchoderma** Olfers, 1814.

8. **Conchoderma virgatum** Spengler, 1763.
9. **Conchoderma virgatum** var. **olfersii**, Leach, 1818.
10. **Conchoderma virgatum** forma **hunteri** Owen, 1830.

Family **Trilasmatidae.**
Genus **Trilasmis** Pilsbry, 1928.

11. **Trilasmis minuta** (Gruvel), 1902.

Genus **Octolasmis** Gray, 1825.

12. **Octolasmis tridens** (Aurivillius) 1893.
13. **Octolasmis warwickii** Gray, 1825.
14. **Octolasmis grayii** (Darwin), 1851.
15. **Octolasmis grayii** var. **pernuda** (Annandale), 1909.
16. **Octolasmis lowei** (Darwin), 1851.
17. **Octolasmis stella** (Annandale), 1909.

18. **Octolasmis cor** var. **A** (Aurivillius), 1893.

19. **Octolasmis cor** var. **B** (Gruvel), 1902.

20. **Octolasmis cor** var. **C** (Gruvel), 1902.

21. **Octolasmis angulata** (Aurivillius), 1894.

Sub-order **Balanomorpha.**
Family **Balanidae.**
Sub-family **Balaninae.**

Genus **Balanus** Da Costa, 1778.
Sub-genus **Megabalanus** Hoek, 1913.

22. **Balanus tintinnabulum tintinnabulum** Linné, 1758.

Sub-genus **Balanus** Da Costa, 1778.

23. **Balanus eburneus** Gould, 1841.

24. **Balanus amphitrite variegatus** Darwin, 1854.

25. **Balanus amphitrite communis** Darwin, 1854.

26. **Balanus amphitrite venustus** Darwin,1854.

27. **Balanus calidus** Pilsbry, 1916.

28. **Balanus perforatus** (Bruguière), 1789.

Sub-genus **Semibalanus** Pilsbry, 1916.

29. **Balanus balanoides** Linné, 1766.

Sub-genus **Chirona** Gray, 1835.

30. **Balanus tenuis** Hoek, 1883.

31. **Balanus amaryllis** forma **euamaryllis,** Broch 1922.

32. **Balanus amaryllis** forma **nivea** Gruvel, 1905.

Sub-genus **Membranobalanus** Hoek, 1913.

33. **Balanus longirostrum** var. **krusadaiensis** var. novo.

Sub-genus **Conopea** Say, 1822.

34. **Balanus calceolus** Darwin, 1854.

35. **Balanus cymbiformis** Darwin, 1854.

Genus **Acasta** Leach, 1817.

36. **Acasta sulcata** var. **spinosa** var. novo.

Sub-family **Tetraclitinae** Nilsson-Cantell, 1921.
Genus **Tetraclita** Schumacher, 1817.

37. **Tetraclita purpurascens** Wood, 1815.

Sub-family **Chelonobinae** Leach, 1817.

38. **Chelonobia testudinaria** Linné, 1761.

39. **Chelonobia caretta** Spengler, 1790.

40. **Chelonobia patula** Ranzani, 1818.

Sub-family **Coronulinae** Gray, 1825.
Genus **Platylepas** Gray, 1825.

41. **Platylepas hexastylos** Fabricius, 1798.

Family **Chthamlidae.**
Genus **Chthamalus** Ranzani, 1817.

42. **Chthamalus stellatus stellatus** Poli, 1791.

SYSTEMATIC ACCOUNT.

Order **Thoracica** Darwin, 1851.
Sub-order **Lepadomorpha** Pilsbry, 1916.
Family **Scalpellidae.**

Genus **Pollicipes** Leach, 1817.

1. **Pollicipes polymerus madrasensis** Daniel, 1953.

Pollicipes polymerus madrasensis Daniel, 1953, p. 286, pl. x, and text fig.

Record.—Eight specimens were collected in the Royapuram shore ; and two specimens from Krusadai Islands.

Distribution.—Bay of Bengal.

Genus **Smilium** (Gray) Broch, **1922.**

2. **Smilium squamuliferum** (Weltner), 1894.

Plate I, figs. 1 and 2 and Plate II, figs. 1—5.

Scalpellum squamuliferum Weltner, 1894, p. 80, figs. 1–5.
Scalpellum squamuliferum Gruvel, 1905, p. 56, fig. 59.
Euscalpellum squamuliterum Pilsbry, 1908, p. 108.
Scalpellum (Smilium) squamuliferum Annandale, 1916, p. 128.
Smilium squamuliferum Nilsson-Cantell, 1938, p. 25.

Record.—Two specimens of this species were obtained from a dredge collection in the Madras inshore waters on 14th March 1950.

Distribution.—This species has been recorded from the Indian Ocean and Malay Archipelago. This is the first record of this species from the Madras Coast.

Size.—The specimens have a capitular length of 26 mm. with a breadth of 16 mm. The peduncle is 21 mm. long and 7 mm. broad. The capitulum (pl. i, figs. 1 and 2) is oval with the apex being acutely pointed, carinal margin being arched and the occludent margin being straight. The valves are thick and very close to one another, with a thick cuticle external to the valves. There are fifteen valves in the capitulum (pl. i, figs. 1 and 2). The tergum is large and narrowly pointed at the apex. The scutum is as large as the tergum. The upper latus resembles the scutum in shape but is smaller in size with the arched basal margin half as long as the scutal and the scuto-tergal angle forming 55°. The infra-median latus is triangular and is twice as high. The rostral-latus is triangular with the rostral margin being slightly longer than the infra-median lateral margin. The carinal-latus and sub-carina are small, triangular with all their three sides equal. The carina is broadly arched and very long, ending a little below the tergal tip. The rostrum is short and broadly arched with the apical tip more pointed than that of the carina. The peduncle is strongly annulated and is provided with sclerites which are rod-shaped. These sclerites are five times as long as thick, are crowded on the ridges and are arranged in oblique rows (pl. i, figs. 1 and 2). The caudal appendage (pl. ii, fig. 1) reaches slightly below the apex of the second basal segment of the sixth cirri, the apical tip bearing a number of long hairs. The mandible (pl. ii, fig. 2) bears seven teeth including those in the lower angle. Maxilla I (pl. ii, fig. 3) has the cutting edge slightly concave. Maxilla II (pl. ii, fig. 4) has three lobes. The labrum (pl. ii, fig. 5) has the lower margin slightly protuberant and fringed with a number of spines of which the outermost is the longest. Paired dorsal filamentary appendages are present. A single complemental male was present.

Family **Iblidae** Annandale, 1909.

Genus **Ibla** Leach, 1825.

3. **Ibla cumingi** Darwin, 1851.

(Plate I, fig. 3 and Plate II, figs. 6–11).

Ibla cumingi Darwin, 1851, p. 183. pl. iv, fig. 8, pl. v, figs. 1–8.
Ibla cumingi and *Ibla sibogae* Hoek, 1907, p. 47.
Ibla cumingi Annandale, 1916, pl. vii, figs. 8 and 9.
Ibla cumingi Nilsson-Cantell, 1938, p. 26.

Record.—Two specimens were collected from the rocky coast of Mahabalipuram on 12th April, 1950.

Distribution.—Indian Ocean : Western, middle and eastern parts ; Malay Archipelago ; Western part of Pacific Ocean to Japan (shore). This is the first record of this species from the Madras coast.

Female (pl. i, fig. 3) ; *Size.*—The specimens obtained have the following dimensions—Length of peduncle 10 mm., breadth of peduncle 6 mm ; length of scutum 3 mm., breadth of scutum at apex 1 mm. ; breadth of scutum at base 2·5 mm. ; length of tergum 4 mm., breadth of tergum 1·5 mm.

The valves along the lateral margin and the inner surface are coloured light blue and the peduncle is dark brown. The number of segments in the anterior and posterior rami of the cirri in the specimen examined is as follows :—

I Cirrus—13, 17 ; II Cirrus—23, 25 ; III Cirrus—22, 24 ; IV Cirrus—23, 25 ; V Cirrus—23, 24 ; VI Cirrus—24, 25.

The second to the sixth pairs of cirri are alike in shape and structure. Each segment has three pairs of spines on the interior margin and a pair of slender bristles at the distal tip. The caudal appendage (pl. ii, fig. 6) is sixteen-jointed and reaches above the tip of the pedicel of the sixth cirrus. The mandible (pl. ii, fig. 7) has three teeth with the lower margin of the large upper teeth non-pectinated and with the upper margins of the second and third teeth pectinated. The upper margin of the second tooth is provided with nine small spines and that of the third with three small spines. Maxilla I (pl. ii, fig. 8) with the free edge having two depressions. The male (pl. ii, fig. 9) is minute with a body length of 1 mm. and a breadth of 0·3 mm. just as those obtained by Stewart (1911). The body is vermiform and whitish in colour. There are two pairs of cirri (pl. ii, fig. 10) of which the first pair is four-jointed and the shorter three-jointed. Maxilla I (pl. ii, fig. 11) with five small spines and a single large spine as the apex.

Family **Lepadidae** (Darwin) Nilsson-Cantell, 1921.

Genus **Lepas** Linné.

4. **Lepas anatifera indica** Annandale, 1909.

(Plate II, figs. 12–15).

Lepas anatifera indica Annandale, 1909, p. 76, fig. 4.

Record.—A number of specimens were collected from the wharves in the Madras harbour ; from seaweeds washed ashore in the Triplicane and San Thome Beach, from pieces of charcoal, along with the closely allied species of *Lepas anserifera.*

Distribution.—Indian Ocean—Bay of Bengal.

The valves are white, covered by a delicate deep purple membrane. Only the left scutum is provided with internal umbonal tooth and the peduncle is shorter than the capitulum. The caudal appendage (pl. ii, fig. 12) is claw-shaped but blunt at the apex, with the penis being shorter than the sixth cirri. There are two lateral appendages on either side at the base of the first cirrus (pl. ii, fig. 13). Maxilla I (pl. ii, fig. 14) is step formed. The mandible (pl. ii, fig. 15) is six-toothed including the lower angle.

5. **Lepas anserifera** Linné, 1761.

(Plate II, fig. 16).

Lepas anserifera Darwin, 1851, p. 81, pl. i, fig. 4.
Lepas anserifera Sundara Raj, 1927, p. 111, pl. xiv, figs. B. 1–2.
Lepas anserifera Nilsson-Cantell, 1938, p. 26.

Record.—A very large number of specimens of this species were collected on floating logs of wood cast ashore at the San Thome Beach, Triplicane Beach, Porto Novo and Chidambaram along with *Lepas anatifera indica*. It occurred in large numbers between November and February.

Distribution.—Pelagic in tropical and temperate seas.

Size.—The specimens obtained have usually a capitular length of about 25 mm. The valves are more distinctly furrowed than in *Lepas anatifera indica*. The scuta of both the sides are provided with an umbonal tooth but the right tooth is much larger than the left tooth and the occludent margin is arched and protuberant. The peduncle is usually longer than the capitulum. There are five filamentary appendages on either side (pl. ii, fig. 16).

6. **Lepas pectinata** Spengler, 1793.

(Plate II, figs. 17–20.)

Lepas pectinata Darwin, 1851, pl. i, fig. 3.
Lepas pectinata Hoek, 1883, p. 40.
Lepas pectinata Nilsson-Cantell, 1938, p. 27.

Record.—Fifteen specimens of this species were obtained along with *Lepas anserifera* on a floating piece of charcoal.

Distribution.—Pelagic in all seas especially tropical.

Size.—The specimens obtained have a capitular length of 3·5 mm. with a breadth of 2 mm. The length of the peduncle is 1·5 mm. The capitulum is somewhat bulged out, especially at the base with the valves very thin and brittle and the external surface furrowed strongly. The tergum has a small depression at the lower margin which accommodates the pointed apical tip of the scuta. The peduncle is only half as long as the capitulum. The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows.—I Cirrus—9, 7 ; II Cirrus—8, 12 ; III Cirrus—12, 12 ; IV Cirrus—11, 11 ; V Cirrus—11, 11; VI Cirrus—12, 12. The pedicel of all the cirri are rather long. The first cirrus (pl. ii, fig. 17) and second cirrus (pl. ii, fig. 18) are figured. A short, rather inconspicuous filamentary appendage (pl. ii, fig. 18) is present on the posterior margin of the swelling at the base of the first cirrus. The caudal appendage (pl. ii, fig. 19) is small and claw-shaped with the outer-margin provided with short spines. The mandible (pl. ii, fig. 20) has six teeth including the inner angle with the upper margin of the second to the sixth teeth bearing pectinated spines. Maxilla I is step formed. Maxilla II is broadly oval.

7. **Lepas bengalensis** Daniel, 1952.

Lepas bengalensis Daniel, 1952, pp. 400–403, text figs. 1–6.

Record.—Twelve adult specimens from a floating feather off Madras. Five specimens from another feather off Kilakarai.

Distribution.—Bay of Bengal.

There are three filamentary appendages.

Genus **Conchoderma**.

8. **Conchoderma virgatum** (Spengler), 1790.

(Plate I, fig. 4 and Plate II, figs. 21–24).

Conchoderma virgatum Darwin, 1851, p. 146, pl. iii, fig. 2.
Conchoderma virgatum Hoek, 1883, p. 55, pl. ii, fig. 13.
Conchoderma virgatum Turner, 1905, p. 430, pl. i, fig. 3.
Conchoderma virgatum Annandale, 1909, p. 82.

Records.—Two specimens were found on the back of a turtle (*Chelone mydas*) off Krusadai Islands on 29th January 1950. A single specimen was found attached to a lernaeid Copepod parasitic on a flying fish off Madras.

Distribution.—Atlantic, Arctic, Pacific, Mediterranean and Indian Oceans.

Size.—The specimens obtained have a capitular length of 17 mm. with a breadth of 8·5 mm. A single large specimen has a length of 20 mm. with a breadth of 10 mm. The tergum is sinuate with the occludent tip of the tergum slightly broader than the carinal tip.

The scutum is three-lobed but not 'Y'-shaped as in *Conchoderma virgatum* forma *hunteri*. The inwardly directed carinal lobe is somewhat broader and shorter than the other two. The carina is arched and reaches above the basal tip of the tergum (pl. i, fig. 4). The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—7, 7 ; II Cirrus—10, 13–14 ; III Cirrus—14, 14 ; IV Cirrus—17, 17 ; V Cirrus—16, 16 ; VI Cirrus—17, 17.

Each segment (pl. ii, fig. 21) has the anterior margin fringed with five long hairs with the distal tip of the posterior margin with 4 pairs of spines. The mandible (pl. ii, fig. 22) bears six teeth. The labrum (pl. ii, fig.24) is broad and fringed with a number of hairs. Maxilla I (pl. ii, fig. 23) is five-stepped with a number of fine bristles on the free edge. There are six filamentary appendages on each side of the prosoma.

9. **Conchoderma virgatum** var. **olfersii**, Leach, 1818.

(Plate I, fig. 5).

Conchoderma virgatum var. *chelonophilus* Darwin, 1851, p. 151, pl. ii, fig. 2 C.
Conchoderma virgatum var. *chelonophilus* Hoek, 1883, p. 55.
Conchoderma virgatum var. *olfersii* Annandale, 1909, p. 82.

Record.—Two specimens were found on the back of a turtle (*Chelone mydas*) off Madras on 30th March, 1950.

Distribution.—Mediterranean and Atlantic Ocean. This is the first record of this variety from the Indian Ocean. The specimens obtained have a capitular length of 9 mm., with a breadth of 5 mm. The capitulum is light purple with three longitudinal stripes distinctly present and of a dark colour. The summit of the capitulum is bluntly pointed and the base is narrow with the centre enlarged. The tergum is short and straight with the end somewhat rounded. The carina is short and slightly arched with the upper tip broader than the base. The upper end of the carina reaches a bit above the apical tip of the upper lobe of the scutum. The scutum is trilobed of which the carinal lobe is broader and slightly shorter than the other two lobes (pl. i, fig. 5).

10. **Conchoderma virgatum** forma **hunteri** (Owen), 1830.

(Plate I, fig. 6).

Conchoderma hunteri Darwin, 1851, p. 153, pl. iii, fig. 3.
Conchoderma virgatum var. *hunteri* Annandale, 1909, p. 80.
Conchoderma virgatum forma *hunteri* Nilsson-Cantell, 1938, p. 27.

Record.—Nine specimens of this form were collected on the back of a turtle *Chelone imbricata* off Madras on 19th June 1950.

Distribution.—Indian and Pacific Oceans. This is the first record of this form from Madras.

The specimens obtained have a capitular length of 10–12 mm. and some smaller specimens measure only 4–5 mm. The large specimens are of a deep purple colour without markings but the smaller specimens are rather transparent and somewhat yellowish brown in colour. The upper part of the capitulum is not angulate behind. The tergum is almost straight and linear. The carina is arched and the scutum is narrowly 'Y'-shaped (pl. i, fig. 6).

Family **Trilasmatidae** Nilsson-Cantell, 1934.

Genus **Trilasmis** (Hinds 1844), Pilsbry, 1928.

11. **Trilasmis minuta** (Gruvel), 1902.

(Plate I, fig. 7 and Plate II, figs. 25–28).

Poecilasma minuta Gruvel, 1902, p. 288, pl. xxiv, fig. 5.
Poecilasma minutum Annandale, 1909, p. 93, pl. vii, figs. 5-7.
Temnaspis minuta Broch, 1931, p. 37.
Trilasmis minuta Nilsson-Cantell, 1938, p. 10.

Record.—It was found in large numbers attached to the carapace, mouth-parts and legs of *Palinurus* sp. off Madras and Shingle Islands.

Distribution.—Malaya, Singapore, Arabian Sea, Bay of Bengal, and Gulf of Manaar. This is the first record of this species from Madras.

The specimens obtained have a capitular length of 5·5 mm. with a breadth of 3·5 mm. The length of the peduncle is about 2·5 mm., with a breadth of 1 mm. One very large specimen has the following dimensions. Length of capitulum—8 mm.; breadth of capitulum 6 mm.; length of peduncle—4 mm.; breadth of peduncle—1·5 mm. In the living condition the valves are white and the peduncle dark brown. The capitulum is ovate with the apex pointed (pl. i, fig. 7). There are seven valves, a single carina, the paired terga and the paired scuta which is vertically segmented. The peduncle is very short, with numerous chitinous spines (pl. i, fig. 7). The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—8, 7–8; II Cirrus—14, 12; III Cirrus—14–12; IV Cirrus—14, 12; V Cirrus—14, 12; VI Cirrus—14, 12.

The first cirrus is far removed from the other cirri. The tip of the posterior rami reaches up to the tip of the penultimate segment of the anterior rami (pl. ii, fig. 25). The anal appendage reaches up to the tip of the basal joint of the sixth cirrus.

The labrum bears a row of small equal teeth. The free cutting edge of Maxilla I (plate ii, fig. 26) bears three long spines above the excavation and seven smaller spines below it. Maxilla II is spatulate and bluntly rounded at the tip (pl. ii, fig. 27). The mandible has six teeth (pl. ii, fig. 28).

Genus **Octolasmis** Gray, 1825.

12. **Octolasmis tridens** (Aurivillius), 1893.

(Plate I, fig. 8 and Plate II, figs. 29–30).

Pœcilasma tridens Aurivillius, 1893, p. 14, pl. i, fig. 13; pl. vi, fig. 12; pl. vii, figs. 13 and 29.
Dichelaspis occlusa Lanchester, 1902, p. 373.
Octolasmis tridens Nilsson-Cantell, 1938, p. 29.

Record.—It was recorded in large numbers from the mouth-parts and entrance to gill chamber of Cray-fish off the coast of Madras.

Distribution.—Pacific Ocean, Phillipines, Gulf of Siam; Kelantan and Trenganum, Malay Peninsula, Straights of Malacca; N. Sumatra, Bay of Bengal. This is the first record of this species from Madras.

Size.—The specimens obtained have a capitular length of 3 mm. with a breadth of 2.5 mm. The valves are pale white with the peduncle pale yellow. The tergum is irregularly triangular, the scutal margin being provided with two excavations. The scutum is split into two segments of which the tergal margin of the carinal segment of the scutum is provided with a small depression near the apex which may be a local variation. The carina is bluntlypointed at the apex reaching just below the tip of the carinal segment of the scutum and has a transverse disc at the base (plate i, fig. 8). The peduncle is highly variable. Out of 50 specimens examined 13 have a peduncular length of 2·5 mm., and about 37 have comparatively longer peduncles of length 3·5 to 4 mm.

The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—6, 6 ; II Cirrus—11, 11 ; III Cirrus—11, 11 ; IV Cirrus—10, 10 ; V Cirrus—9, 9 ; VI Cirrus—9, 9.

The first cirrus is very short and the basal segments of both rami are very long (pl. ii, fig. 29). The anal appendage (pl. ii, fig. 30) reaches up to the tip of the second basal segment of the 6th cirrus. The penis is very long and regularly ringed.

The labrum is bullate and without teeth. Maxilla I has the cutting edge provided with a single incissure with 3 to 4 short spines above the incissure and a dozen spines below. The mandible has five teeth.

13. **Octolasmis warwickii** Gray, 1825.

(Plate I, fig. 9 and Plate II, figs. 31–33).

Dichelaspis warwickii Darwin, 1851, p. 120, pl. ii, figs. 6, 6a, 6b.
Dichelaspis equina Lanchester, 1902, p. 385, pl. xxv, fig. 7.
Dichelaspis equina Annandale, 1907, pl. V, figs. 4–6.
Dichelaspis warwickii Annandale, 1909, p. 110.
Octolasmis warwickii Nilsson-Cantell, 1938, p. 11.

Record.—It is commonly attached to the mouth-parts, limb and carapace of slow-moving Decapod Crustacea such as *Neptunus sanguinolentus, Neptunus pelagicus, Palinurus* sp. off the coast of Madras, Tuticorin and Krusadai Islands.

Distribution.—Indian Ocean, Malay Archipelago, and South China Sea. This is the first record of this species from Madras.

The length of the capitulum varies from 7 mm. to 10 mm., with a breadth of about 5 to 6 mm. The length of the peduncle is highly variable, varying from the length of the capitulum to about double its length. The capitulum is ovid (pl. i, fig. 9) as described in detail by Annandale (1909). He states that the occludent margin is nearly straight, but out of 50 specimens examined by the author 43 specimens have a slight depression above the tip of the occludent segment of the scutum which may be a local variation. The tergum is shaped like an axe ; the carina extends upwards above the carinal angle, with a transverse fissure near the base. The occludent margin of the occludent segment of the scutum is slightly convex (pl. i, fig. 9). The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—6, 6–7 ; II Cirrus—10, 10 ; III Cirrus—11, 11 ; IV Cirrus—11, 11 ; V Cirrus—11, 11 ; VI Cirrus—12, 12. The anterior ramus of the first cirrus is always provided with 6 joints. The posterior ramus according to Annandale (1909) is always six-jointed but out of 20 specimens examined 15 had seven joints. Those provided with six joints have the basal segment very long with a constriction in the middle. The penis is bulbous with the apex retroverted (pl. iii, fig. 33). The mandible is 5-toothed. Maxilla I (pl. iii, fig. 32) has a very large spine at the apex of the cutting edge and immediately followed by a smaller spine. The cutting edge is then gradually convex and bears 13 spines. The anal appendage (pl. iii, fig. 33) is slender and is provided with a bunch of hairs at the apex.

14. **Octolasmis grayii** (Darwin), 1851.

(Plate I, fig. 10 and Plate III, figs. 34–38).

Dichelaspis grayii, Darwin 1851, p. 123, pl. ii, fig. 9.
Dichelaspis pellucida Darwin, 1851, p. 125, pl. ii, fig. 9.
Dichelaspis pellucida Annandale, 1906, a. p. 140.
Octolasmis grayii Nilsson-Cantell, 1938, p. 29.

Record.—Twenty-three specimens were obtained from the scales of the sea-snake *Hydrophis* sp.

Distribution.—Indian Ocean ; Bay of Bengal ; Orissa Coast, Pacific Ocean. This is the first record of this species from Madras.

The specimens obtained have the following dimensions :—

Length of capitulum—7 mm. ; breadth of capitulum—4·5 mm. ;
Length of peduncle—14·5 mm. ; breadth of peduncle—2 mm.

The capitulum is bonnet-shaped with the carinal margin arched and the occludent margin sinuous. The tergum is shaped like an axe with a slender handle. The scutum has vertical and horizontal branches. The carina is very slender and forked at the base (pl. i, fig. 10). The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—5, 5 ; II Cirrus—7, 7 ; III Cirrus—7, 7 ; IV Cirrus—8, 8 ; V Cirrus—8, 8 ; VI Cirrus—8, 8. The first pair of cirri is far removed from the other pairs. The 2nd to the 6th pairs of cirri (pl. iii, fig. 34) are alike in shape and structure. Each segment (pl. iii, fig. 38) bears at its margin 3 pairs of long spines and another short pair. The anal appendage (pl. iii, fig. 34) which is six-segmented reaches far above the tip of the 2nd segment of the 6th cirrus. The labrum (pl. iii, fig. 35) is bullate and has 9 minute teeth. The cutting edge of maxilla I (pl. iii, fig. 36) bears an excavation and bears 3 spines above it and 5 spines below it. The mandible (pl. iii, fig. 37) is 5-toothed.

15. Octolasmis grayii var. **pernuda** (Annandale), 1909.

(Plate I, fig. 11 and Pl. III, fig. 39).

Dichelaspis grayii var. *pernuda* Annandale, 1909, p. 115. Text fig. 1, 2 & 3.

Record.—143 specimens were collected from the scales of three snakes of *Enhydrina* sp. from the coast of Madras.

Distribution.—Bay of Bengal. This is the first record of this variety from Madras.

The large specimens have the following dimensions :—

Length of capitulum—4 mm. Breadth of capitulum—2·5 mm. Length of peduncle—6 mm. Breadth of peduncle—1 mm. The smaller specimens which are more common, have a capitular length ranging from 2·5 to 3 mm. The specimens are reddish brown. Out of fifty specimens examined there is no trace of any of the valves in eighteen specimens. In all the specimens examined there is no trace of the tergum. About ten specimens have the carina somewhat developed and is visible only after staining. Only 32 of the 50 specimens examined have the scutum and even in these it is reduced to a thin vertical streak-like plate (pl. i, fig. 11). In this variety the anal appendage is not segmented. As described by Annandale (1909) the apical tip is provided with a bunch of long hairs but in the specimens examined there is a very long hair in addition to the other pairs (pl. iii, fig. 39).

16. Octolasmis lowei. (Darwin), 1851.

(Plate I, fig. 12 and Plate III, figs. 40-41).

Dichelaspis lowei Darwin, 1851, p. 128, pl. ii, fig. 8.
Paradalepas neptuni Macdonald, 1869, p. 440.
Dichelaspis sinuata Aurivillius, 1893, p. 17, fig. 2–5.
Dichelaspis trigona Aurivillius, 1893, p. 19, pl. ii, fig. 8.
Dichelaspis vaillanti Gruvel, 1902, p. 279, pl. xiv, fig. 5, 13.
Octolasmis geryonophila Pilsbry, 1907-a p. 94, fig. 32 a b.
Dichelaspis geryonophila Annandale, 1902, p. 112, pl. vi, fig. 10–15.
Octolasmis lowei Nilsson-Cantell, 1938, p. 2.

Record.—It occurs only in the gill region of Decapod Crustacea like *Palinurus* sp. and *Neptunus* sp. collected off the coast of Madras and Rayapuram.

Distribution.—Indian Ocean, Malay Archipelago, Australia, Japan, Formosa, Atlantic Ocean. This is the first record of this species from Madras.

Size.—The length of the capitulum varies from 2·5 mm. to 3 mm. with a breadth of 2 mm.

The capitulum (pl. i, fig. 12) is laterally compressed, highly variable in shape, sometimes provided with a distinct lobe on the upper extremity of the occludent margin as in *D. sinuata* (Aurivillius), sometimes this lobe being absent as in *D. lowei* (Darwin); the capitulum is sometimes ovoid as in *O. geryonophila* (Pilsbry). The tergum is saddle-shaped. The scutum consists of two branches meeting one another at an angle of between 70° and 90°, far above the base of the capitulum. The basal branch of the scutum is highly variable. It is usually linear as in *D. lowei* of Darwin, *D. sinuata* of Aurivillius, and *D. vaillanti* of Gruvel, and rarely triangular as in *O. geryonophila* (Pilsbry). The carina also is highly variable, usually being narrow and long with a pair of branches at the base. The anal appendage reaches beyond the apex of the first basal segment of the pedicel of the sixth cirrus and the rounded apex bears 4 to 7 long hairs.

Mouth parts.—The labrum is bullate with blunt teeth on the upper surface. The cutting edge of Maxilla I (pl. iii, fig. 40) has an incissure near the apex and bears 2 spines above the incissure and 7 spines below the incissure. The mandible (pl. iii, fig. 41) bears five teeth including the inner angle which is provided with two pairs of spines, of which one is long and the other short.

17. **Octolasmis stella** (Annandale), 1909.

(Plate I, fig. 13 and Plate III, figs. 42 43).

Dichelaspis stella Annandale, 1909, p. 117, text fig. 10.

Record.—Two specimens were collected from the gills of *Neptunus pelagicus* from off the coast of Rameswaram on 2nd February, 1950.

Distribution.—Bay of Bengal. This is the first record of this species from Madras.

Size.—The specimens obtained have a capitular length of 2·5 mm. with a breadth of 1·5 mm.

In formalin it is reddish brown, the peduncle being light brown. The capitulum is laterally flattened with the occludent margin vertically straight and the carinal margin strongly rounded (pl. i, fig. 13).

The tergum is four-rayed, the lateral rays are equal, the top ray is shorter, while the lower is longer.

The scutum is divided into two segments, a vertical occludent segment and a linear carinal segment.

The carina is slender, strongly arched, the apical tip being pointed which reaches slightly above the tip of the occludent segment of the scutum. The smooth peduncle is twice as long as the capitulum. The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—6, 6 ; II Cirrus—13, 13 ; III Cirrus—13, 13 ; IV Cirrus—13, 13 ; V Cirrus —13, 13 ; VI Cirrus—13, 13.

The anal appendage is very thin, just touching the apical end of the basal joint of the sixth cirrus with long fine hairs at the tip.

Mouth parts.—Labrum with a row of minute equal teeth.

Maxilla I (pl. iii, fig. 42) has a shallow incissure in the middle with four stout spines above it and five spines below it.

Maxilla II is rounded and broad ; Mandible (pl. iii, fig. 43) : no mention is made about the mandible by Annandale who created this species in 1909. In the single specimen dissected and examined the mandible has six teeth, the lower two being small. The lower margin is fringed with five hairs and the upper margin bears three pairs of hairs. The upper tooth is very large and is removed from the rest by a concavity which has at its middle a single small hair.

18. **Octolasmis cor** var. **A** (Aurivillius), 1893.

(Plate I, fig. 14 and Plate III, figs. 44-46).

Dichelaspis cor Aurivillius 1893, p. 20, figs. 1 and 2.
Dichelaspis maindroni Gruvel 1902 a, p. 282, pl. iv, figs. 21-27.
Dichelaspis coutteri Gruvel, 1902 a, p. 289, pl. iv, figs. 28-32.
Dichelaspis maindroni Annandale 1908, pl. iii.
Dichelaspis cor var. *A.* Annandale, 1909, p. 119, pl. vi, figs. 7-10.

Record.—It occurs in large numbers on the gills of the edible crab *Scylla serrata*, very common in Krusadai, Mandapam, Rameswaram and Madras.

Distribution.—Indian Ocean and Malay Archipelago. This is the first record of this variety from Madras.

Size.—Commonly ranges from 3 mm. to 4 mm.; the largest specimen measured 4·5 mm.

The capitulum is heart-shaped.

Valves.—The tergum is completely absent but in most specimens examined the capitular membrane at the place occupied by the tergum in the other species is greatly thickened and dark-coloured. The carina is curved with transverse basal branches which are turned upwards towards the scutum. The scutum is formed of two plates, a vertical occludent plate which is almost linear but considerably broader in the middle than at the base extending along the curved occludent margin. The basal branch has the extremity truncate and expanded (pl. i, fig. 14).

The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—5, 5 ; II Cirrus—11, 12, 11-12 ; III Cirrus—11-13, 11-13. IV Cirrus—11-13, 11-13 ; V Cirrus—11-13, 11-13 ; VI Cirrus—11-13, 11-13. The second to the

6th pairs of cirri are alike in shape and structure. Each segment bears three pairs of long hairs at the anterior margin (pl. iii, fig. 44). Anal appendages (pl. v, fig. 17) are highly variable in length and armature bearing a dense apical fringe of hairs which extend downwards on the outer margin.

Mouth parts.—The labrum is bullate; Maxilla I (pl. iii, fig. 45) is provided with seven pairs of teeth, the three upper being long and the smaller teeth alternating with longer ones. The mandible (pl. iii, fig. 46) is provided with five teeth as described in detail by Annandale, but in three specimens out of ten specimens examined the fifth tooth is divided into two out of which the upper one has a small spine which is bifid at its tip and the lower one has a single long spine.

19. **Octolasmis cor** var. **B** (Gruvel), 1902.

(Plate I, fig. 15).

Dichelaspis cor var. *B* Annandale, 1909, p. 119.

Record.—It occurs in large numbers along with *Octolasmis cor*. var. *A* and var. *B* in the gills of the edible crab *Scylla serrata.*

Distribution.—Indian Ocean and Malay Archipelago. This is the first record of this variety from Madras.

This variety established by Gruvel (1902 a) and confirmed by Annandale (1909) does not differ in any feature excepting the shape of the scuta from *O. cor.* var. *A* and *O cor.* var. *C*. As seen in the figure (pl. i, fig. 15) the scuta has the extremity of the basal branch of the scutum truncate and expanded to a less marked extent than in the variety A and the occludent branch of the scutum is barely broader in the middle than at the base.

20. **Octolasmis cor** var. **C** (Gruvel), 1902.

(Plate I, fig. 16).

Dichelaspis cor var. *C* Annandale, 1909, p. 119.

Record.—This variety was recorded in large numbers along with *O. cor* var. *A* and var. *B* in the gills of the edible crab *Scylla serrata.*

Distribution.—Indian Ocean and Malay Archipelago. This is the first record of this variety from Madras.

This variety, also established by Gruvel (1902 a) and confirmed by Annandale (1909), has all the valves linear without expansions at the extremity of any (pl. i, fig. 16).

21. **Octolasmis angulata** (Aurivillius), 1893.

(Plate I, fig. 17).

Dichelaspis angulata Aurivillius, 1893, p. 22, pl. ii, figs. 9–11.
Dichelaspis aperta Aurivillius, 1893, p. 24, pl. i, figs. 14–16.
Dichelaspis cuneata Aurivillius, 1893, p. 25, pl. i, figs. 17–19 ; pl. vi, figs. 10–11.
Dichelaspis bullata Aurivillius, 1893, p. 26, pl. ii, figs. 12, 13.
Dichelaspis tansversa Annandale, 1906, p. 44, figs. 1–10.
Dichelaspis angulata Nilsson-Cantell, 1938, p. 10.

Record.—It has been recorded in large numbers from the gills of *Palinurus* sp. *Neptunus pelagicus*, *Neptunus sanguinolentus*, *Matuta victor*, etc., from off Madras, Tuticorin and Krusadai Islands.

Distribution.—Bay of Bengal ; Arabian Sea ; Malay Archipelago. This is the first record of this species from Madras. The specimens are very small in size, the usual capitular length being 1·5 mm.

Valves.—The scutum is always present but very variable in shape. In most specimens examined there was usually a single vertical branch which was sinuous and rarely consisting of two branches meeting at an angle greater than a right angle of which the upper is the longer and broader.

Carina.—Out of 100 specimens examined about 80 specimens showed the presence of the carina and in the remaining 20 the carina was totally absent.

Tergum.—This is absent as a valve but is represented by an amorphous patch (pl. i, fig. 17). Anal appendage broad and reaches the tip of the upper basal segment of the 6th cirrus. It is either single or two-jointed.

Sub-order **Balanomorpha** Pilsbry, 1916.
Family **Balanidae** Gray, 1825.
Sub-family **Balaninae** Darwin, 1854.
Genus **Balanus** Da Costa, 1778.
Sub-genus **Megabalanus.**

22. **Balanus tintinnabulum tintinnabulum** (Linné), 1758.

(Plate IV, figs. 1–6).

Balanus tintinnabulum var. *communis* Darwin, 1854, p. 195.
Balanus tintinnabulum tintinnabulum Pilsbry, 1916, p. 55.
Balanus tintinnabulum var. *communis* Darwin (sub-sp. *tintinnabulum* Pilsbry), Sundara Raj, 1927, p. 113.
Balanus tintinnabulum tintinnabulum Nilsson-Cantell, 1938, p. 33.

Record.—This is a very common variety found on the south-western side and northern side of the Madras harbour, under the Pamban Bridge and also in Cape Comorin, usually attached to rocks.

Distribution.—Mediterranean Sea, Atlantic and Indian Ocean.

Size.—The specimens obtained have a basal diameter of about 35 mm.

Colour.—Purplish pink externally with dark black lines arranged in groups in longitudinal stripes and the inner margins are whitish in colour.

Shape.—Tubulo-conic with the orifice of the shell being trigonal. The basis is stronger than the compartments. The radii are transversely permeated by pores. The internal views of the tergum (pl. iv, fig. 1) and scutum (pl. iv, fig. 2) are figured. The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—18-20, 16-18 ; II Cirrus—16-18, 12-14 ; III Cirrus—14-15, 11-12 ; IV Cirrus—21, 23 ; V Cirrus—26, 26 ; VI Cirrus—30–31. The first pair of cirri is rather short with the distal borders of the segments of the rami provided with minute scales in addition to the anterior long spines. The 2nd and 3rd cirri are provided with protuberant segments, with the pedicel of the latter being relatively longer. The 4th, 5th and 6th pairs are alike. The anterior margin of each segment (pl. iv, fig. 6) bears three pairs of long and a fourth pair of short spines and a regular row of spinules border each segment distally. Four to five short spines are found on the posterior distal tip of each segment.

Mouth parts.—Labrum (pl. iv, fig. 5) is straight with a narrow notch. The mandible (pl. iv, fig. 3) bears five teeth. Maxilla I bears seven pairs of large spines (pl. iv, fig. 4).

Sub-genus **Balanus** Da Costa.

23. **Balanus eburneus** Gould, 1841.

(Plate IV, figs. 7-11).

Balanus eburneus Darwin, 1854, p. 248.
Balanus eburneus Pilsbry, 1916, p. 79.
Balanus eburneus Neue, 1935, p. 93.
Balanus eburneus Nilsson-Cantell, 1938, p. 35.

Record.—Eleven specimens were obtained from a rope in New North Quay of the Madras harbour on 19th November, 1949. This is the first record of this species from India.

Distribution.—Massachusetts to the Caribbean coast of South America (Nilsson-Cantell, 1938). Nilsson-Cantell (1938) recording this species from Port Said states that it will be interesting to follow the further distribution of this species, which was one of the endemic forms of the New World. In 1951, Bishop collected this species in the British waters from a merchant vessel which had come from the Mediterranean. The record of this species from the Madras harbour extending its range of distribution to the tropical waters denotes the importance of the part played by ships in the distribution of cirripedes.

Size.—The specimens obtained have an average carino-lateral diameter of 8 mm. with a height of 11 mm.

Colour.—White with the opercular valves and parietes covered by a yellow membrane.

Shape.—Obliquely conic.

Shell.—Parietes are porous and the basis calcareous.

Valves.—As described in detail by Pilsbry 1916, the scutum (pl. iv, fig. 7) has fine growth ridges crossed by clearly cut radial grooves. Both the articular and adductor ridges are very high. Tergum (pl. iv, fig. 8) without an external furrow. The basal margin on the carinal side of the longspur has a deep concavity.

The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—31, 19 ; II Cirrus—21, 16 ; III Cirrus—23, 20 ; IV Cirrus—30, 30 ; V Cirrus —32, 32 ; VI Cirrus—35, 35. The protuberant anterior ramus of the 3rd cirrus is armed with a distal row of erect spike-like spinules.

Mouth parts.—Labrum (pl. iv, fig. 9) with the notch and numerous teeth decreasing in size towards the notch. Maxilla I (pl. iv, fig. 10) with a pair of large spines at the apical end of the free edge and another pair at the lower margin which stands on the protuberance. There are seven small spines in between, which are finely pectinated. Mandible (pl. iv, fig. 11) with six teeth including the lower angle and the 2nd tooth bearing a short spine.

24. **Balanus amphitrite variegatus** Darwin, 1854.

(Plate IV, figs. 12–14).

Balanus amphitrite variegatus Darwin, 1854, p. 241.
Balanus amphitrite variegatus Nilsson-Cantell, 1934, a.p. 60.
Balanus amphitrite variegatus Nilsson-Cantell, 1934, b.p. 51.
Balanus amphitrite variegatus Nilsson-Cantell, 1938, p. 39.

Record.—This is a very common form found attached to piles, buoys, rocks, etc., in the Madras harbour. This sub-species is richly represented in the Madras harbour.

Distribution.—Indian Ocean, Malay Archipelago, China, New South Wales and New Zealand.

The specimens obtained have an average carino-lateral diameter of 9·5 mm. with a height of 13·5 mm. ; deeply conical ; parietes are porous with the ridges of the inner side corresponding with the septa, with the radii narrow and the summits oblique.

The spur of the tergum (pl. iv, fig. 12) is longer than in the other sub-species and out of 50 specimens examined 40 have the edge of the spur rounded and in the other ten it is bluntly pointed.

The number of segments in the anterior and posterior rami in the specimens examined is as follows :—

I Cirrus—16-18, 10-12 ; II Cirrus—12-14, 10-12 ; III Cirrus—14-16, 12-14 ; IV Cirrus—27, 28 ; V Cirrus—28, 28 ; VI Cirrus—30, 31.

In the 2nd cirrus the anterior margin does not bear recurved teeth (pl. iv, fig. 14). The recurved teeth of the third cirrus are stronger and more deeply curved on the front margin of the anterior ramus than on the posterior ramus. A single segment of the anterior ramus of the third cirrus is figured (pl. iv, fig. 13).

Mouth parts.—Labrum with a deep notch and with four teeth on either side. Mandible with five teeth.

25. **Balanus amphitrite communis** Darwin, 1854.

(Plate IV, figs. 15-21).

This sub-species has been described by Weltner, 1857, Lanchester, 1902, Nilsson-Cantell, 1921, 1938 and Stubbings, 1936.

Record.—This sub-species is richly represented in the Adyar river on stones, oyster shells, snails, etc. A large number of specimens were obtained from *Telescopium* shells at Porto Novo and Ennur. Five specimens were obtained from rocks at Kilakarai and a number of specimens from Royapuram shores.

Distribution.—According to Nilsson-Cantell 1938, it is "definitely known from West India, European waters, Mediterranean, West and South Africa, Indian Ocean, Malay Archipelago, New South Wales, Pacific Ocean, Japanese waters and Hawaii islands."

Size.—The specimens obtained have an average carino-lateral diameter of 11 mm. with a height of 8·5 mm.

Colour.—White with violet-coloured longitudinal stripes and the radii freckled with pale reddish colour (pl. iv, fig. 15).

The scutum (pl. iv, fig. 17) has a very weak adductor ridge and the articular ridge is well developed. The short spur of the tergum (pl. iv, fig. 16) of this sub-species clearly differentiates it from that of *B. amphitrite veriegatus.* A single segment of the third cirrus (pl. iv, fig. 19) is figured. Each segment on its anterior margin is provided with six recurved spines (pl. iv, fig. 19) and six long spines.

Mouth parts.—Labrum (pl. iv, fig. 18) with the notch deep and 8 to 9 teeth on either side. Mandible (pl. iv, fig. 21) with the upper three teeth well developed and the two lower teeth very feebly developed and the ill-developed lower angle provided with a single small spine. Maxilla I (pl. iv, fig. 20) with the cutting edge straight and a pair of long spines at the base and apex with about seven smaller spines in the middle.

26. **Balanus amphitrite venustus** Darwin, 1884.

(Plate V, figs. 1–6).

Balanus amphitrite venustus Annandale, 1906 a, p. 147.
Balanus amphitrite venustus Sundara Raj, 1927, p. 113, pl. xii.
Balanus amphitrite venustus Nilsson-Cantell, 1938, p. 37, text fig. 8.

Record.—Nine specimens were obtained attached to *Avicula* sp. in the Madras harbour on 6th March, 1950.

Distribution.—Mediterranean, West and South of Africa, Indian Ocean and Japan.

Size.—The specimens obtained have a carino-lateral diameter of 10·5 mm. with a height of 8 mm.

Colour.—White with broad pink stripes.

Shape.—Conical.

The scutum (pl. v, fig. 3) has a prominent articular ridge which is more than half as long as the tergal margin and the adductor ridge is rather feeble. The tergum (pl. v, fig. 5) with the spur broad and the basicarinal margin sometimes hollowed out.

Cirri.—The first cirrus has the posterior ramus shorter than the interior ramus by four segments. The two rami of the second cirrus are almost equal. The anterior ramus of the third cirrus is longer than the posterior ramus by four segments. As seen in the figure (pl. v, fig. 1) there are many small spines in the anterior distal part of each segment of both rami. The fourth, fifth and sixth pairs of cirri are also provided with similar smaller spines but they are smaller. The penis is longer than the sixth cirrus and is provided with a very long basi-dorsal point.

Mouth parts.—The labrum (pl. v, fig. 6) has three teeth on either side. The mandible (pl. v, fig. 2) is toothed of which the fourth and fifth are rudimentary with the interior angle poorly developed. Maxilla I (pl. v, fig. 2) with the lower margin of the free edge slightly protuberant. There are two pairs of long spines placed on this step which is rather removed from the lower angle. At the apex also there are two pairs of long spines with five pairs of smaller spines in the middle.

27. **Balanus calidus** Pilsbry, 1916.

(Plate V, figs. 7–12).

Balanus spongicola var. with the walls slightly folded longitudinally—Darwin, 1854, p. 225, pl. 4, fig. 1.d.
Balanus calidus Pilsbry, 1916, p. 118, p. 25, fig. 1 c.

Record.—Two specimens were imbedded in a sponge along with *Acasta sulcata* which was obtained from a dredge collection of Royapuram waters on 13th January, 1951.

Distribution.—West Indies, from St. Vincent to the northern coast of Gulf of Mexico. 8-88 fathoms (Pilsbry, 1916). This is the first record of this species from India.

Size.—The specimens obtained have a carino-lateral basal diameter of 3·5 mm. with a height of 3·5 mm.

Colour.—Pale white, with the unstraited portion of the sheath purple.

Shape.—The shell is tubulo-conical with radii narrow and oblique and the edge crenate.

Shell.—Parietes porous, with the radii non-porous, and the base cancave from below.

The scutum is provided (pl. v, fig. 7) with crowded growth ridges and radial striae, with the articular ridge ending in a free point. The adductor ridge is short. The tergum (pl. v, fig. 8) has the spur very near the basiscutal angle with the beak blunt and short. The basal margin is almost straight on both sides of the spur making angles on both sides thus differing from the closely allied *B. spongicola.*

Cirri.—The third cirrus has rami of 11 and 10 segments with the third to the sixth segments of the anterior margin of the anterior ramus having teeth which are mainly trifid. The third and fourth segments of the anterior ramus are figured (pl. v, fig. 10). The fourth cirrus has very minute teeth near the distal border of all segments of the anterior ramus. Cirrus five and six have three pairs of spines of which one pair is very small.

Mouth parts.—Labrum (pl. v, fig. 9) with three teeth on either side. The labial palp bears a dense fringe of spines along the upper margin. The mandible is (pl. v, fig. 12) 5-toothed. Maxilla I (pl. v, fig. 11) with the free edge provided with a pair of long spines at the apex and at the base, having six spines between these two pairs.

28. **Balanus perforatus** Bruguière, 1789.

(Plate V, figs. 13–20).

Balanus perforatus Darwin, 1854, p. 231.
Balanus perforatus Pilsbry, 1916, p. 123.

Record.—Twelve specimens were collected from a dredge collection in Madras harbour on 15th December, 1950.

Distribution.—Darwin who described this species in 1854 states that it has been recorded from "Southern shores of England, South Wales, Mediterranean, West Africa; Southward to London; West India"; and Pilsbry who redescribed this species in 1916 states that "the distribution of this form in West Indies and South America is doubtful and has to be confirmed." This is the first record of this species from India.

Size.—The largest specimens obtained had a carinolateral basal diameter of 13·5 mm. and a height of 35 mm.

Colour.—The shell is purple in the large specimens and white in the smaller specimens.

Shape.—The shell is conical with the orifice oval and unusually small.

Shell.—Parietes porous, with the narrow radii non-porous.

The scutum (pl. v, fig. 18) with the growth ridges prominent and the moderately developed articular ridge extended into a flat style at the base ; characteristic short minute ridge present which is parallel and very close to the adductor ridge.

The tergum (pl. v, figs. 13 and 14) has a prominent beak. The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—27, 15 ; II Cirrus—13, 13 ; III Cirrus—14, 10 ; IV Cirrus—21, 24 ; V Cirrus—22, 24 ; VI Cirrus—26, 28.

The anterior ramus of the first cirrus is twice as long as the protuberant posterior ramus. Both the rami of the second cirrus are almost equal and has the anterior margin highly protuberant. Cirrus 3 with the middle segments (pl. v, fig. 19) of both rami bearing recurved teeth, and the segments near the base provided with multified scale.

As described by Pilsbry (1916) the fourth cirrus has the outer ramus armed with the recurved teeth, and the lower part is provided with upcurved teeth on the posterior border. The inner ramus does not possess any teeth on the anterior margin but there are posterior teeth (pl. v, fig. 15). Cirrus 5 and 6 as described in detail by Pilsbry.

Mouth parts.—Labrum (pl. v, fig. 20) without teeth ; The mandible (pl. v, fig. 17) has three large teeth, the fourth and fifth being small, the fifth confluent with the lower angle. Maxilla I (pl. v, fig. 16) with the cutting edge having twelve long spines.

29. **Balanus balanoides** Linné, 1776.

(Plate VI, figs. 1–10).

Balanus balanoides Darwin, 1854, p. 267, p. 1–7, figs. 2 a—3 d.
Balanus balanoides Stimpson, 1863, p. 110.
Chthamalus europoeus Phillipi, 1892, p. 454.
Balanus balanoides Pilsbry, 1916, p. 182–184, text fig. 58, pl. 44., pt. 45, 2–20.

Record.—Nine living specimens were obtained from the bottom of a merchant vessel from Europe which was staying temporarily in the Madras harbour.

Distribution.—Distributed from Latitude 66° 34′ North, in the Arctic Ocean to the Ocean coast of France, and to the Delaware Bay ; in the Pacific from Unalaska to Sitka.

Size.—The specimens obtained have a height of 26 mm. with a basal diameter of 4 mm. and 6 mm. at the apex.

Colour.—Pale white.

Shape.—(pl. vi, fig. 5). All the specimens obtained were elongate and cylindrical with the apex broader than the base and very fragile.

Shell.—The base is membranous. The parietes are very smooth on the inner side. The articular ridge of the tergum is triangular and there is a short spur at the base (pl. vi, figs. 1 and 2).

The scutum (pl. vi, fig. 3) has a long basal margin with the apex bluntly pointed and a callus is present which runs from the articular ridge. The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—15, 10 ; II Cirrus—10, 10 ; III Cirrus—11, 11 ; IV Cirrus—18, 20 ; V Cirrus—19, 19 ; VI Cirrus—24, 24. In the first pair of cirri (pl. vi, fig. 6) the anterior ramus is narrow and elongated while the posterior is broad and short. The second pair of cirri (pl. vi, fig. 7) is also very short with both rami of almost equal length.

Mouth parts.—Labrum (pl. vi, fig. 9). The central notch is rather deep with six teeth on the right side and five on the left. Maxilla I (pl. vi, fig. 10) has the cutting edge almost straight with about 12 spines. Mandible (pl. vi, fig. 8) has four teeth ; the upper three teeth well developed while the fourth is rather blunt.

Sub-genus **Chirona** Gray, 1835.

30. **Balanus tenuis** Hoek, 1883.

(Plate VI, figs. 11–16).

Balanus tenuis Hoek, 1883, p. 154, pl. xiii, figs. 29–33.
Balanus albus Hoek, 1913, p. 185, pl. xvi, figs. 12–13.
Balanus tenuis Hoek, 1913, p. 191, pl. xvii, figs. 14–19.
Balanus tenuis Nilsson-Cantell, 1938, p. 4 and 46.

Record.—Three small specimens were obtained from an empty snail shell in a dredge collection made off Madras coast.

Distribution.—Indian Ocean ; Malay Archipelago ; Japan. This is the first record of this species from Madras.

Size.—The specimens obtained have a height of 6 mm. with a basal diameter of 5 mm.

Colour.—The shell is dirty white and is provided with pale red longitudinal lines.

Shape.—Conical with the orifice distinctly toothed.

Shell.—The basis is rounded, thin and fragile which crumble to bits when specimens are removed from the snail shell. The radii are very narrow and visible only along the lower half of the compartments and the summits are very oblique. The broad alae has its apex rounded. The lower inner margin of the compartments are provided with very strong ridges which decrease in depth from the base to the apex. Neither compartments nor radii have pores.

Valves.—Scutum (pl. vi, fig. 11). The articular ridge is prominent with the adductor ridge inconspicuous. The scutal margin of the tergum (pl. vi, figs. 12 and 13) is only slightly hollowed with a very weak beak. The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—16, 19 ; II Cirrus—13, 12 ; III Cirrus—12, 13 ; IV Cirrus—24, 24 ; V Cirrus—31, 31 ; VI Cirrus—32, 32,

The segments of the fourth to sixth pairs of cirri (pl. vi, fig. 15) are longer than broad and are provided with two pairs of long and a third pair of short microscopic spines and there are small tufts of spines between each of the longer pairs.

Mouth parts.—Labrum with three pairs of teeth close together pointed outwards with small hairs arranged along the margin. The mandible is 4-toothed (pl. vi, fig. 16).

Maxilla I (pl. vi, fig. 14) with the free edge bearing a pair of long spines at the apex and another at the base and six smaller spines in between.

31. **Balanus amaryllis** forma **euamaryllis** Broch, 1922.

(Plate VI, figs. 17–21).

Balanus amaryllis Darwin, 1854, p. 279.
Balanus amaryllis forma *euamaryllis* Broch, 1922, p. 321.
Balanus amaryllis forma *euamaryllis* Broch, 1931, p. 66.
Balanus amaryllis forma *euamaryllis*, Nilsson-Cantell, 1934, p. 68.
Balanus amaryllis forma *euamaryllis*, Nilsson-Cantell, 1938, p. 46.

Record.—Twelve specimens were obtained from a buoy in Madras harbour on 1st September, 1950.

Distribution.—Indian Ocean ; Malay Archipelago ; China ; Japan ; Northern Coast of Australia. This is the first record of this form from Madras.

Size.—The specimens obtained have a basal diameter of 26 mm. with a height of 42 mm.

Colour.—The parietes are rosy-pink, with the radii white and is covered by a persistent yellow epidermis. The alae is bluish white.

Shell.—The basis is calcareous and porous. The radii are not very narrow with the upper margins very oblique and the alae is broader than the radii and have rounded summits. The tergum (pl. vi, fig. 17) is striated longitudinally with the striae dividing prominent lines of growth into squarish beads. The scutum (pl. vi, fig. 21) is plainly striated longitudinally with the articular ridge short and the adductor ridge blunt. The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—26, 19 ; II Cirrus—18, 17 ; III Cirrus—24, 22 ; IV Cirrus—47, 47 ; V Cirrus—55, 55 ; VI Cirrus—57, 57.

The anterior margin of the shorter ramus of the first cirrus is very protuberant. The segments of the 4th, 5th and 6th pairs of cirri are broader than long bearing only two pairs of nearly equal long spines and between each pair there is a small intermediate tuft.

Mouth parts.—Labrum (pl. vi, fig. 20) with the notch wide, and three small teeth on either side. Mandible (pl. vi, fig. 19) with five teeth including the lower angle. Maxilla I (pl. vi, fig. 18) with a pair of long spines at the apex and another long pair at the base and between these pairs there are seven shorter spines.

32. **Balanus amaryllis** forma **nivea,** Gruvel, 1905.

(Plate VII, figs. 1 and 2).

Balanus amaryllis var. *b* Darwin, 1854, p. 270.
Balanus amaryllis var. *niveus* Gruvel, 1905, p. 250.
Balanus amaryllis forma *nivea* Broch, 1922, p. 322.
Balanus amaryllis forma *nivea* Nilsson-Cantell, 1938, p. 48.

Record.—Twenty-two specimens of this form were obtained in a dredge collection off Madras on 16th February, 1951.

Distribution.—Malay Archipelago; Pacific Ocean; Indian Ocean; Bay of Bengal; Arabian Sea.

Size.—The smaller specimens obtained have a basal diameter of 15 mm. with a height of 11 mm. Two large specimens have a carino-lateral diameter of 18 mm. and a height of 25 mm.

Colour.—The parietes are pinkish white with red lines running from the apex to the base.

Shell.—The basis is calcareous and porose; the edges of the radii are finely crenulated.

The external sculpture of the opercular plates is very delicate and the spur fasciole shallow, although distinct (plate vii, figs. 1 and 2).

Sub-genus **Membranobalanus** Hoek, 1913.

33. **Balanus longirostrum** var. **krusadaiensis** var. novo.

(Plate VII, figs. 3–10).

Record.—150 specimens were collected from about 10 sponges, *Suberites inconstans,* taken at low tide from sponge bay at Krusadai.

Distribution.—Krusadai Islands, Bay of Bengal.

Size.—Most of the specimens have an average height of 12·5 mm. with a diameter of 5·5 mm. The largest specimen obtained has a height of 15·6 mm. with a diameter of 7 mm.

Shape.—(pl. vii, fig. 3). The specimens are distinctly conical with a very small orifice which is almost uniformly toothed. The shell is as high as it is broad.

Colour.—White.

Shell.—The walls of the shell are thin with the compartments weakly united with the sutures of the radii, not septate. The rostrum is boat-shaped and twice as long as the other compartments and bears a median longitudinal furrow externally. The carina is strongly arched with the lower half very narrow. Carino-laterals are very narrow about one-third as broad as the laterals.

The scutum (pl. vii, fig. 8) is convex and has two shallow depressions. The tergum is beaked (pl. vii, fig. 4). The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—80, 20-27 ; II Cirrus—9–10, 11–12 ; III Cirrus—12–13, 15–16 ; IV Cirrus—18–20, 20–22 ; V Cirrus—24–26, 30–31 ; VI Cirrus—24–26, 30–31. In the first cirrus (pl. vii, fig. 6) the anterior ramus reaches up to the tip of the 8th segment of the posterior ramus. The 2nd and 3rd are alike in shape and structure.

Each segment of the fourth, fifth and sixth pairs of cirri bears three stout upwardly directed spines in the anterior marogin (pl. vii, fig. 5).

Mouth parts.—Labrum (pl. vii, fig. 10) with the notch wide and with three teeth on either side. Mandible (pl. vii, fig. 7). Hoek (1913) has described a single spine at the inferior angle. But in all the specimens, the present author finds two more small spines above this inferior spine and below the last tooth. Maxilla I (pl. vii, fig. 9) as seen in figure.

Remarks.—This variety differs from the typical form of the species by the possession of two small spines above the inferior spine in the mandible and also in the shell being distinctly conical, the orifice being small and uniformly toothed, the shell being as high as broad and the carina being strongly arched with the lower half very narrow and is hence treated as a new variety, *Balanus longirostrum* var. *krusadaiensis* var. novo.

Sub-genus **Conopea** Say, 1822.

34. Balanus calceolus Darwin, **1854**.

(Plate VII, figs. 11–16).

Balanus calceolus Hoek, 1913, p. 221.
Balanus calceolus Pilsbry, 1916, p. 238.
Balanus calceolus Broch, 1931, p. 238.
Balanus calceolus, Nilsson-Cantell, 1938, p. 55.

Record.—Two specimens attached to Gorgonidae, were obtained from a dredge collection off the coast of Madras on 15th December, 1949.

Distribution.—West coast of Africa, Mediterranean; Indian Ocean; Malay Archipelago; Australia; Japan.

Size.—The specimens obtained have a basal diameter of 11 mm. with a height of 10·5 mm.

Colour.—Parietes purplish red with longitudinal lines and white transverse lines; radii and rostrum white.

Shape.—(pl. vii, fig. 11) The shell is elongated in its rostro-carinal axis. The basis at the carinal end is produced downwards into a fine point.

Shell.—Parietes porous, the longitudinal septa of the tubes denticulated; basis porose and having a deep furrow on the underside. Scutum (pl. vii, fig. 12) with the basitergal corner rounded. With the articular ridge feebly developed and the adductor ridge completely absent. Tergum (pl. vii, fig. 13) with broad spur, one-third the width of the valve and the lower margin gradually rounded. The number of segments in the anterior and posterior rami of the cirri is as follows :—

I Cirrus—17, 11; II Cirrus—13, 13; III Cirrus—10, 10; IV Cirrus—24, 24; V Cirrus—24, 24; VI Cirrus—26, 26. Each segment of the fourth to the sixth cirri bears at its anterior margin two pairs of long spines and another pair of comparatively shorter spines (pl. vii, fig. 15).

Mouth parts.—Labrum (pl. vii, fig. 16) with a notch and three teeth on either side. Mandible 5-toothed. Maxilla I: between the two long pairs at the apex and the base there are 4 pairs of smaller spines (pl. vii, fig. 14).

35. **Balanus cymbiformis** Darwin, 1854.

(Plate VIII, figs. 1–6).

Balanus proripiens Hoek, 1913, p. 228.
Balanus proripiens Nilsson-Cantell, 1921, p. 313.
Balanus cymbiformis Stubbings, 1936, p. 46.
Balanus cymbiformis Nilsson-Cantell, 1938, p. 55.

Record.—A single specimen attached to Gorgonidae along with *Balanus calceolus* was obtained from a dredge collection off the coast of Madras on 15th December, 1949.

Size.—The specimen obtained has a carino-lateral diameter of 10 mm. with a height of 3·5 mm.

Colour.—Compartments purplish red with the basis white.

Shape.—(pl. viii, fig. 2) Shell almost equally elongated in its rostro-carnial axis with the basis symmetric and boat-shaped.

Shell.—Parietes solid, inner surface strongly ribbed; radii narrow with the sutural edges crenulated. Basis not porose. **Scutum** (pl. viii, fig. 4) with the basitergal corner deeply rounded; articular ridge feebly developed and adductor ridge absent. Tergum (pl. viii, fig. 1) broad and equilateral, spur very broad, half as broad as the valve.

The number of segments in the anterior and posterior rami of the cirri is as follows :—

I Cirrus—16, 12 ; II Cirrus—14, 12 ; III Cirrus—14, 11 ; IV Cirrus—29, 30 ; V Cirrus —32, 32 ; VI Cirrus—33, 33.

The middle segments of the posterior ramus is highly protuberant (pl. viii, fig. 3). Each segment of the fourth to sixth cirri bears three pairs of long setae (pl. viii, fig. 6).

Mouth parts.—The mandible (pl. viii, fig. 5) is 6-toothed including the lower angle, with the fourth tooth distinctly double-edged.

Genus **Acasta** Leach, 1817.

36. **Acasta sulcata** var. **spinosa** var. novo.

(Plate VIII, figs. 7–14).

Record.—Four specimens were imbedded in a sponge along with *Balanus calidus* which was obtained from a dredge collection off Royapuram shore on 13th January, 1951.

Distribution.—Madras, Bay of Bengal.

Size.—The specimens obtained have a basal diameter of 6·5 mm. with a height of 7·5 mm.

Shape.—(pl. viii, fig. 8) The basis is cup-shaped with the orifice moderately small and toothed.

Colour.—Pale white with a tinge of flesh colour.

Shell.—The edge of the cup-shaped basis is crenated. Externally the parietes are provided with small calcareous projections. The bases of the inner surface of the parietes are ribbed. The carino-lateral parietes are very narrow, about 1/20th the width of the laterals. Scutum (pl. viii, fig. 13) with the adductor ridge conspicuous and the articular ridge feebly developed. Tergum (pl. viii, fig. 7) with the spur broad and square. The number of segments in the anterior and posterior rami of the cirri is as follows :—

I Cirrus—15, 6 ; II Cirrus—**9**, 6 ; III Cirrus—11, 10 ; IV Cirrus—14, 19 ; V Cirrus—23, 23 ; VI Cirrus—27, 28. In the first pair of cirri (pl. viii, fig. 10) the anterior ramus is thrice as long as the posterior. The second pair of cirri are very short and the third cirrus is about twice the length of the second but smaller than the first. The anterior ramus of the fourth cirrus (pl. viii, fig. 9) is provided with recurved spines pointed downwards but are absent on the posterior ramus as is present in the typical form of *A. sulcata* Darwin.

In the specimens dissected even the anterior ramus of the fifth cirrus is provided with recurved spines which is a peculiar feature for this species. The anterior ramus of the sixth cirrus also, in segments 9–20 has a single recurved spine. Each segment bears three pairs of spines.

Mouth parts.—Labrum (pl. viii, fig. 14) has a deep notch with three teeth on either side, but the outermost pair is placed lower than the peripheral margin. Mandible (pl. viii, fig. 11) with sixth teeth including the lower angle, the distance between the first and second teeth being almost equal to that between the second and third. The fourth and fifth teeth are very near to one another and to the basal margin. The lower margin bears fine hairs. Maxilla I (pl. viii, fig. 12) with the free edge straight and with a pair of long spines at the apex and at the base. Five pairs of shorter spines are placed in between the longer pairs.

Remarks.—The new variety herein described differs from the typical form of *Acasta sulcata* Darwin by the possession of recurved spines in the anterior ramus of the fifth cirrus and also a single recurved spine in the anterior ramus of the sixth cirrus in segments 9–20 and by the absence of any such recurved spine in the posterior ramus of the fourth cirrus as is the case in the typical form.

Sub-family **Tetraclitinae** Nilsson-cantell, 1921.

Genus **Tetraclita** Schumacher, 1817.

37. Tetraclita purpurascens Wood, 1818.

(Plate IX, figs. 1-5).

Tetraclita purpurascens Darwin, 1854, p. 337.
Tetraclita purpurascens Nilsson-Cantell, 1938, p. 13.

Record.—Twelve specimens were obtained from an old ship gone aground in the Royapuram beach (i.e., entrance to the Madras harbour) on 17th February, 1950.

Distribution.—Madagascar ; Malay Archipelago ; China. This is the first record of this species from India.

Size.—The specimens obtained are very small with an average diameter of 1·5 mm.

Shape.—The shell is greatly flattened with the orifice rounded.

Colour.—White.

Shell.—Compartments four, the walls thick with the small parietal tubes arranged in two or three rows with the tubes in the upper part filled up and the radii very narrow.

Scutum (pl. ix, fig. 1) transversely elongated; the basal margin is nearly twice as long as the tergal margin, articular and adductor ridges very feebly developed. Tergum (pl. ix, fig. 1) very small, with spur extremely short and very close to the basi-scutal angle of the valve.

Each segment of the fourth to the sixth pairs of cirri bear two pairs of main spines with a tuft of small spines between each pair (pl. ix, fig. 4).

Mouth parts.—Labrum notched and without teeth (pl. ix, fig. 5). Mandible (pl. ix, fig. 3) 4-toothed with the fourth tooth very small. Maxilla I (pl. ix, fig. 2) with a notch below the large pair of spines. Below the notch three spines are present.

Sub-family **Chelonobinae** Pilsbry, 1916.

Genus **Chelonobia** Leach, 1817.

38. **Chelonobia testudinaria** Linné, 1761.

(Plate-IX, figs. 6-9).

Chelonobia testudinaria Darwin, 1854, p. 392, p. 14.
Chelonobia testudinaria Kruger, 1911, p. 57, figs. 121–125.
Chelonobia testudinaria Pilsbry, 1916, p. 264.
Chelonobia testudinaria Nilsson-Cantell, 1938, p. 77.

Record.—Twenty-four specimens from the back of a turtle *Chelone mydas* off Royapuram coast. Nine specimens from *Chelone imbricata* off Krusadai Islands. Eleven specimens from the back of *Chelone mydas* at Tuticorin.

Distribution.—Tropical and temperate seas.

Size.—Most of the specimens have an average basal diameter of 35 mm.

Shape (pl. ix, fig. 6).—The shell is conical and depressed with a broadly oval outline.

Colour.—Dirty white.

Shell.—The parietes are very thick and numerous vertical plates of varying lengths extend from the outer lamina some reaching to the solid and broad inner lamina. Radii are very narrow with notches on both sides (pl. ix, fig. 6). The scutum and tergum are much elongated and narrow.

The first pair of cirri is far removed from other pairs with unequal rami. The second pair is shorter and thicker than in *C. caretta* and *C. patula*.

The third pair of cirri is long, almost equal in length to the other pairs. Each segment of the fourth to sixth pairs of cirri bears two pairs of main spines between each of which there is a tuft of fine spines.

Mouth parts.—Labrum (pl. xi, fig. 9) with a number of small teeth on either side. The mandible (pl. ix, fig. 7) is 5-toothed with the second and third teeth double pointed. Maxilla I (pl. ix, fig. 8) with the free cutting edge bearing a number of large spines, the spines reducing in length from the apex to the base.

39. **Chelonobia caretta** (Spengler), 1790.

(Plate IX, fig. 10).

Chelonobia caretta Darwin, 1854, p. 394, pl. 14.
Chelonobia caretta Pilsbry, 1916, p. 267.
Chelonobia caretta Borradaile, 1903, p. 443.
Chelonobia caretta Nilsson-Cantell, 1938, p. 14.

Record.—Six specimens of this species were obtained from the back of *Chelone mydas* off Madras coast.

Distribution.—Tropical seas. This is the first record of this species from India.

Size.—The specimens have an average basal diameter of 5 mm.

Shape.—(pl. ix, fig. 10) The specimens obtained are flattened with the orifice oval and the compartments asymmetrical (i.e.) the rostrum being pushed to one side.

Colour.—White.

Shell.—The shell is very strong with the parietes being solid. With the base of the sheath and the radiating septa being dentated. Radii not developed and the alae are very indistinct. The scutum is elongate with the occludent margin curved. The tergum is elongate with the external furrow completely absent.

The second pair of cirri is comparatively longer than in *C. testudinaria*. The other parts resemble those of *Chelonobia testudinaria* (vide supra).

40. **Chelonobia patula** Ranzani, 1820.

(Plate IX, fig. 11).

Chelonobia patula Darwin, 1854, p. 396, pl. 24, figs. 3*a*, 3*b*, 4.
Chelonobia patula Pilsbry, 1916, p. 268.
Chelonobia patula Nilsson-Cantell, 1934, p. 61.
Chelonobia patula Nilsson-Cantell, 1938, p. 77.

Record.—Twenty-five specimens were obtained from *Scylla serrata* off Tondi. Twelve specimens from *Scylla serrata* at Adyar.

Distribution.—Atlantic Ocean; Mediterranean; Indian Ocean; Malay Archipelago; Pacific Ocean.

Size.—The specimens from Tondi have a basal diameter of 30 mm. but the specimens from Adyar measure only 17 mm. in basal diameter.

Shape.—(pl. ix, fig. 11). The shell is conical, orifice large, polygonal and toothed.

Colour.—Yellowish white.

Shell.—The shell is very light, fragile and very loosely cemented which distinguishes this species from *C. testudinaria* and *C. caretta.* The outer lamina of the parietes and radiating septa are very thin. The parietes is porous from base to apex. Radii are very broad and smooth. The scutum is very narrow and elongated. The tergum is also very narrow, with the spur more prominent than in the other two, *C. testudinaria* and *C. caretta.*

The other parts of this species resemble those of *Chelonobia caretta* (vide supra).

Sub-family **Coronulinae** Gray, 1825.

Genus **Platylepas** Gray, 1825.

41. Platylepas hexastylos Fabricius, 1798.

(Pl. IX, figs. 12—17).

Platylepas bisexlobata Darwin, 1834, p. 428, pl. 17, figs. 1a—1d.
Platylepas bisexlobata Kruger, 1912, p. 13.
Platylepas hexastylos Pilsbry, 1916, p. 289, p. 167, figs. 1, 1c, 3.
Platylepas hexastylos Richards, 1930, p. 143.

Record.—Six large specimens and five smaller specimens of this species were obtained imbedded in *Chelone mydas* off Royapuram coast on 19th January, 1950.

Distribution.—Tropical and sub-tropical seas. This is the first record of the species from India.

Size.—The large specimens have a basal diameter of 7·5 mm.

Shape.—All the specimens obtained are greatly depressed and oval; orifice also oval with the external surface sculptured with concentric ridges (pl. ix, fig. 16).

Colour.—The specimens are yellowish due to the external membrane in which it is imbedded. When this membrane is removed, it is lustrous white.

Shell.—The porous parietes of each compartment bears a deep internal midrib which gives support to the membranous basis. Radii very narrow with alae smooth. The scuta and terga (pl. ix, fig. 13) are elongated and narrow. The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—8,6 ; II Cirrus—9,8 ; III Cirrus—11,10 ; IV Cirrus—24,25 ; V Cirrus—27,27 ; VI Cirrus—27,27.

The first segment of the anterior ramus of the first cirrus is very long (pl. ix, fig. 17). Each segment of the fourth, fifth and sixth pairs of cirri bears four pairs of spines.

Mouth parts.—Labrum (pl. ix, fig. 12) with deep notch and three teeth on either side. Maxilla I (pl. ix, fig. 14). The upper end of the cutting edge is slightly depressed and bears a pair of long spines ; and there are three pairs of smaller spines and a simple long spine along the straight cutting edge. The mandible (pl. ix, fig. 15) is five-toothed including the lower angle ; between the second and third and between the third and fourth teeth there are two very small teeth. The lower angle bears three spines.

Family **Chthamalidae** Darwin, 1854.

Genus **Chthamalus** Ranzani, 1820.

42. Chthamalus stellatus stellatus (Poli), 1791.

(Plate X, figs. 1–12).

Chthamalus stellatus Darwin, 1854, p. 455, pl. 18.
Chthamalus stellatus Gruvel, 1905, p. 201.
Chthamalus stellatus stellatus, Nilsson-Cantell, 1938, p. 30.

Record.—This is a very common species found on rocks and shells in the Royapuram beach, Mahabalipuram, Pamban Bridge, Shingle Islands and Mandapam.

Size.—The specimens obtained have a basal diameter of 6.5 mm. with a height of 2.5 mm.

Shape.—(pl. ix, fig. 2). The shell is conically depressed, almost rounded, with oval orifice.

Colour.—The shell is grey, merging with the colour of the rocks to which they are attached.

Shell.—The carino-laterals are absent and the rostro-laterals are present. Parietes not porous, but a number of furrows and ridges occur on the inner surface. Radii are very narrow, with the alae also very narrow with the edges crenated. The scutum (pl. ix, fig. 1) is abruptly truncate near the basitergal angle. The adductor ridge is absent. Tergum (pl. x, figs. 8 and 9). The articular ridge is broadly reflexed and trangular. In all the specimens examined there is a rudiment of the spur at the basitergal angle. The number of segments in the anterior and posterior rami of the cirri in the specimens examined is as follows :—

I Cirrus—5,5 ; II Cirrus—7,6 ; III Cirrus—11,12 ; IV Cirrus—11,12 ; V Cirrus—13,13 ; VI Cirrus—14,16. The first and second pairs of cirri are figured (pl. ix, figs. 3 and 4).

In the second pair of cirri the terminal segment of the posterior ramus bears a large spine with toothed edges (pl. x, fig. 7) along with other smaller spines which is a characteristic feature of this variety. The terminal segment of the anterior ramus bears three such short pectinated spines. Each segment of the third to sixth pairs of cirri, bears about five pairs of long spines (pl. x, fig. 10).

Mouth parts.—The labrum is concave with a hairy edge (pl. x, fig. 11). The mandible is (pl. x, fig. 5) four-toothed, with the third and fourth teeth double-pointed. Following the fourth tooth, there are two rows of slender spines, each row containing twelve spines. Maxilla I (pl. x, fig. 6) with two long spines at the apex followed by three small spines and then a group of seven spines with the lower margin fringed with a number of hairs. Maxilla II (pl. x, fig. 12). Elongated and bearing six very long curved spines at the upper end, the inner margins being fringed with a number of small hairs.

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PLATE I.

Fig. 1 *Smilium squamuliferum* (Weltner)—side view.
,, 2 Do. do —carinal view.
,, 3 *Ibla cumingi* Darwin—side view.
,, 4 *Conchoderma virgatum* Spengler—side view.
,, 5 *Conchoderma virgatum* var. *olfersii* Leach—side view.
,, 6 *Conchoderma virgatum* forma *hunteri* Owen—side view.
,, 7 *Trilasmis minuta* (Gruvel)—side view.
,, 8 *Octolasmis tridens* (Aurivillius)—side view.
,, 9 *Octolasmis warwickii* Gray—side view.
,, 10 *Octolasmis grayii* (Darwin)—side view.
,, 11 *Octolasmis grayii* var. *pernuda* (Annandale)—side view.
,, 12 *Octolasmis lowei* (Darwin)—side view.
,, 13 *Octolasmis stella* (Annandale)—side view.
,, 14 *Octolasmis cor* var. *A.* (Aurivillius)—side view.
,, 15 *Octolasmis cor* var. *B.* (Gruvel)—side view.
,, 16 *Octolasmis cor* var. *C.* (Gruvel)—side view.
,, 17 *Octolasmis angulata* (Aurivillius)—side view.

PLATE I

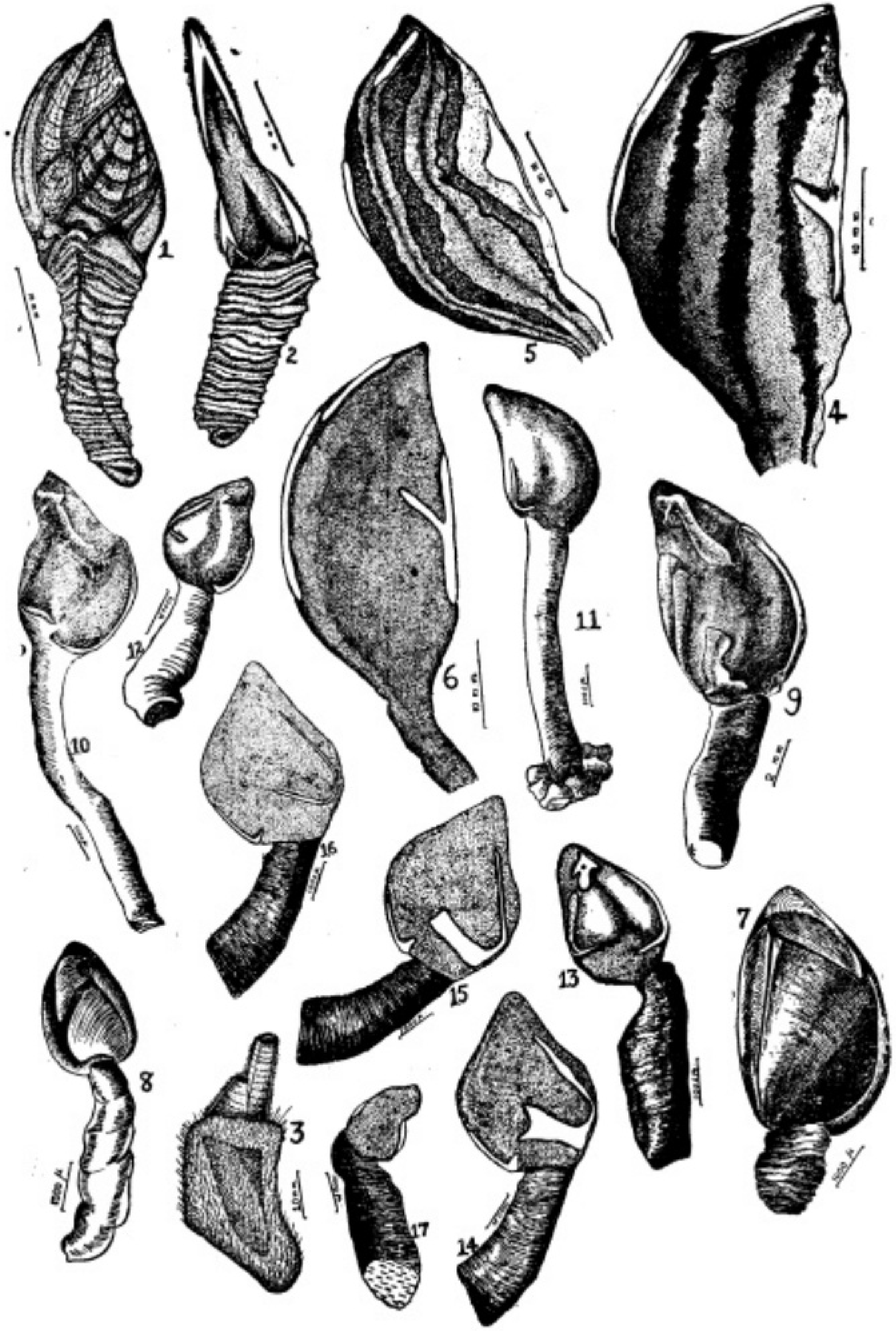

PLATE II.

Smilium squamuliferum (Weltner)—Figs. 1—5.

Fig. 1 Caudal appendage with the base of 6th Cirrus and base of penis.
,, 2 Mandible.
,, 3 Maxilla I.
,, 4 Maxilla II.
,, 5 Labrum.

Ibla cumingi Darwin—Figs. 6—11.

Fig. 6 Caudal appendage.
,, 7 Mandible.
,, 8 Maxilla I.
,, 9 Male—side view.
,, 10 Cirri of Male.
,, 11 Maxilla I of Male.

Lepas anatifera indica Annandale—Figs. 12—15.

Fig. 12 Caudal appendage.
,, 13 First cirrus with filamentary appendages.
,, 14 Maxilla I.
,, 15 Mandible.

Lepas anserifera Linné—Fig. 16.

Fig. 16 First cirrus with filamentary appendage.

Lepas pectinata Spengler—Figs. 17—20.

Fig. 17 First cirrus with filamentary appendages.
,, 18 Second cirrus.
,, 19 Caudal appendage.
,, 20 Mandible.

Conchoderma virgatum (Spengler)—Figs. 21—24.

Fig. 21 Single segment.
,, 22 Mandible.
,, 23 Maxilla I.
,, 24 Labrum.

Trilasmis minuta (Gruvel)—Figs. 25—28.

Fig. 25 First cirrus.
,, 26 Maxilla I.
,, 27 Maxilla II.
,, 28 Mandible.

Octolasmis tridens (Aurivillius)—Figs. 29—30.

Fig. 29 First cirrus.
,, 30 Base of the cirrus with caudal appendage and penis.

PLATE II

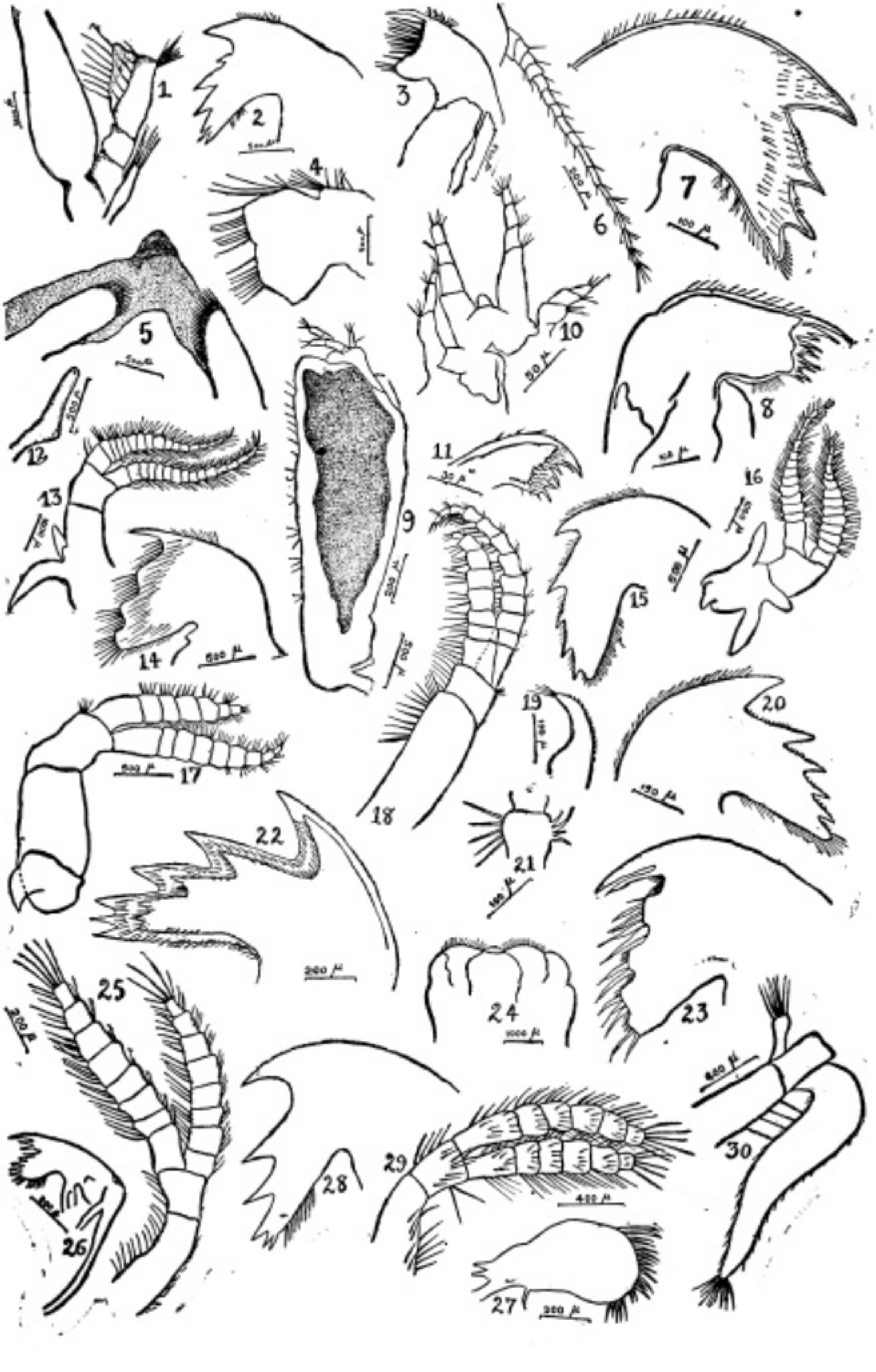

PLATE III.

Octolasmis warwickii Gray—Figs. 31—33.

Fig. 31 Mandible.
,, 32 Maxilla I.
,, 33 Caudal appendage with the penis and base of 6th cirrus.

Octolasmis grayii (Darwin)—Figs. 34—38.

Fig. 34 Sixth cirrus with penis and caudal appendage.
,, 35 Labrum.
,, 36 Maxilla I.
,, 37 Mandible.
,, 38 Single segment of sixth cirrus.

Octolasmis grayii var. *pernuda* (Annandale)—Fig. 39.

Fig. 39 Base of sixth cirrus with caudal appendage and penis.

Octolasmis lowei (Darwin)—Figs. 40—41.

Fig. 40 Maxilla I.
,, 41 Mandible.

Octolasmis stella (Annandale)—Figs. 42—43.

Fig. 42 Maxilla I.
,, 43 Mandible.

Octolasmis cor var. *A.* (Aurivillius)—Figs. 44—46.

Fig. 44 Sixth cirrus with caudal appendage.
,, 45 Maxilla I.
,, 46 Mandible.

PLATE III

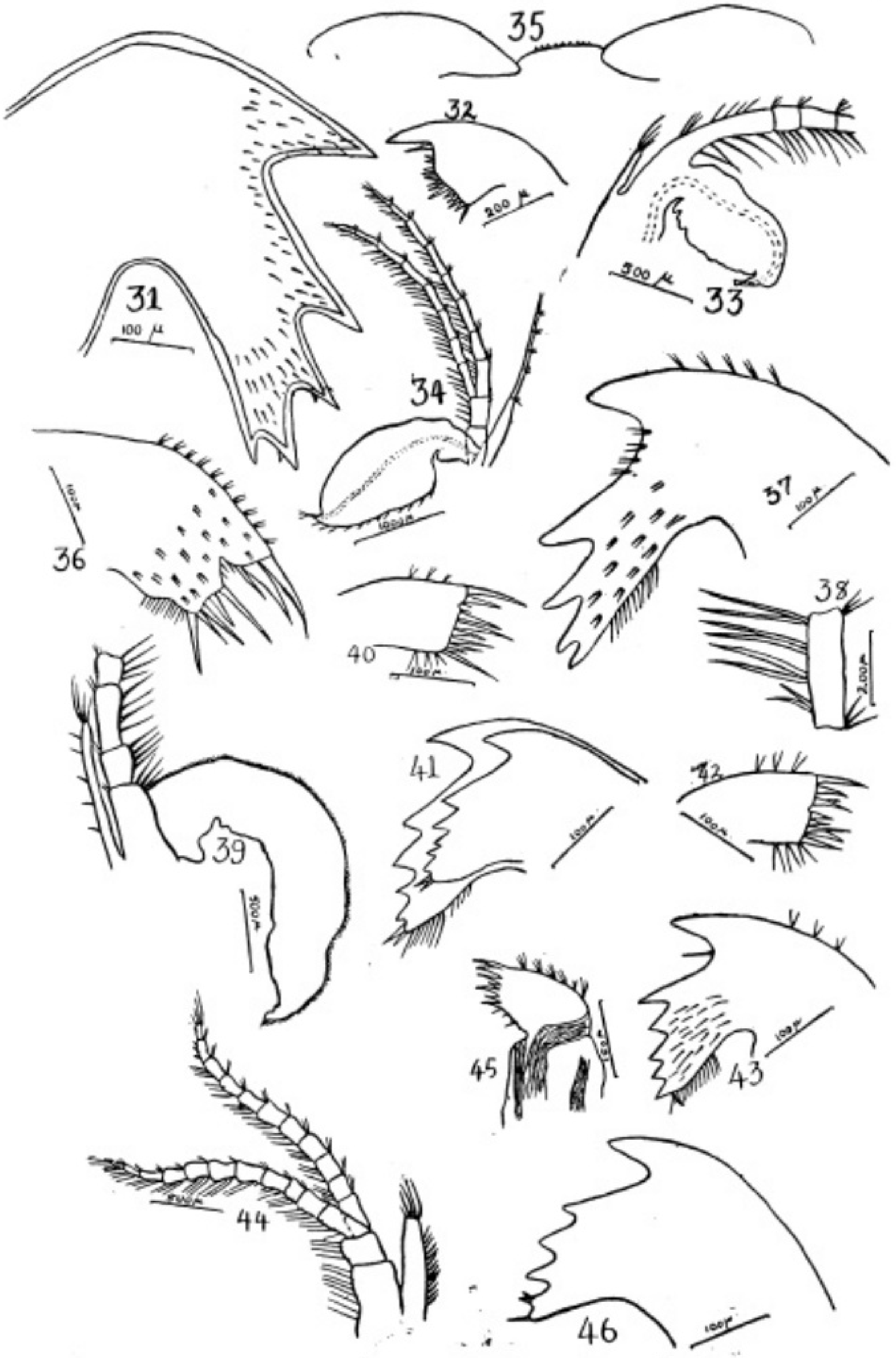
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PLATE IV.

Balanus tintinnabulum tintinnabulum Linné—Figs. 1—6.

Fig. 1 Tergum—inner view.
,, 2 Scutum—inner view.
,, 3 Mandible.
,, 4 Maxilla I.
,, 5 Labrum.
,, 6 Single segment of fourth cirrus.

Balanus eburneus Gould—Figs. 7—11.

Fig. 7 Tergum—inner view.
,, 8 Scutum—inner view.
,, 9 Labrum.
,, 10 Maxilla I.
,, 11 Mandible.

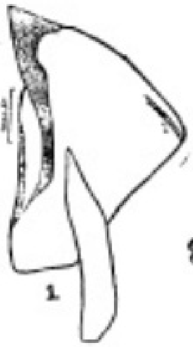
Balanus amphitrite variegatum Darwin—Figs. 12—14.

Fig. 12 Scutum—inner view.
,, 13 Single segment of anterior ramus of third cirrus.
,, 14 Second cirrus.

Balanus amphitrite communis Darwin—Figs. 15—21.

Fig. 15 Entire animal.
,, 16 Tergum—inner view.
,, 17 Scutum—inner view.
,, 18 Labrum.
,, 19 Segment of third cirrus.
,, 20 Maxilla I.
,, 21 Mandible.

PLATE IV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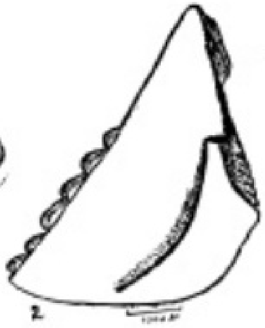
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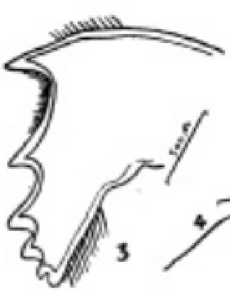
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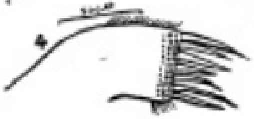
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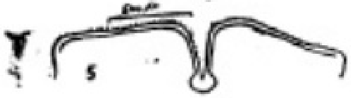
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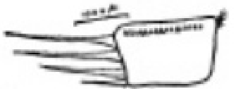
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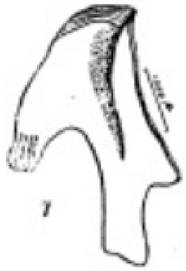
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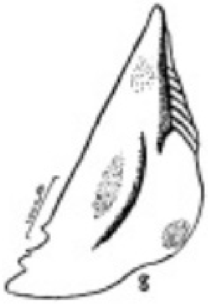
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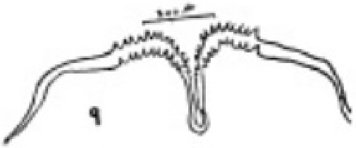
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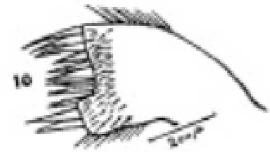
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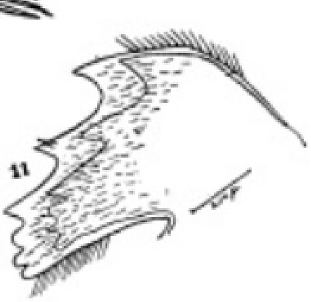
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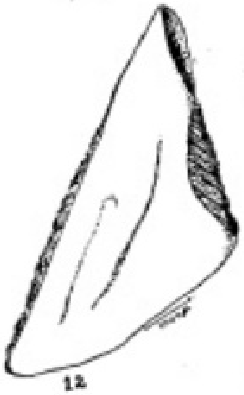
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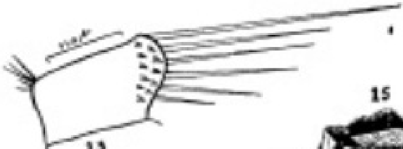
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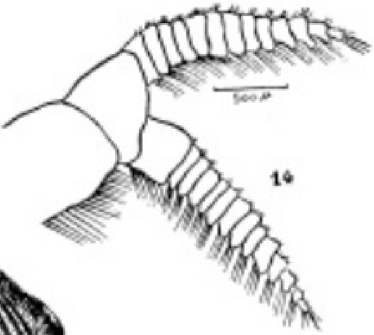
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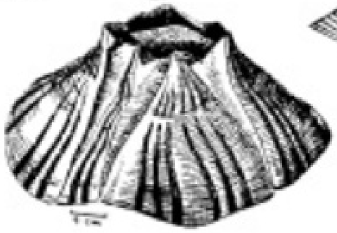
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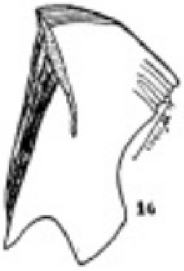
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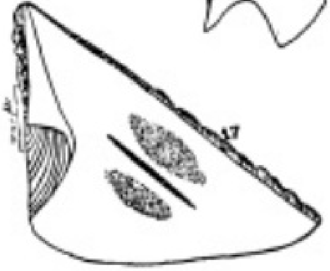
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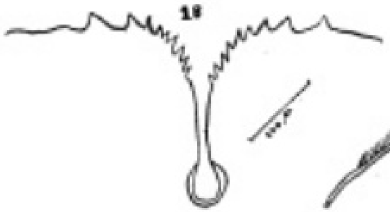
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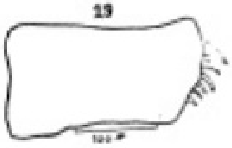
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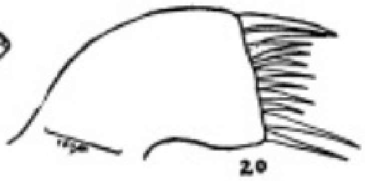
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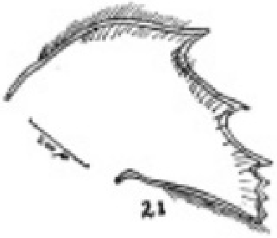
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PLATE V.

Balanus amphitrite venustus Darwin—Figs. 1—6.

Fig. 1 Single segment of third cirrus.
,, 2 Mandible.
,, 3 Scutum—inner view.
,, 4 Maxilla I.
,, 5 Tergum—inner view.
,, 6 Labrum.

Balanus calidus Pilsbry—Figs. 7—12.

Fig. 7 Scutum—inner view.
,, 8 Tergum—inner view.
,, 9 Labrum.
,, 10 Single segment of anterior ramus of fourth cirrus.
,, 11 Maxilla I.
,, 12 Mandible.

Balanus perforatus (Bruguière)—Figs. 13—20.

Fig. 13 Tergum—external view.
,, 14 Tergum—inner view.
,, 15 Single segment of fourth cirrus.
,, 16 Maxilla I.
,, 17 Mandible.
,, 18 Scutum.
,, 19 Single segment of third cirrus.
,, 20 Labrum.

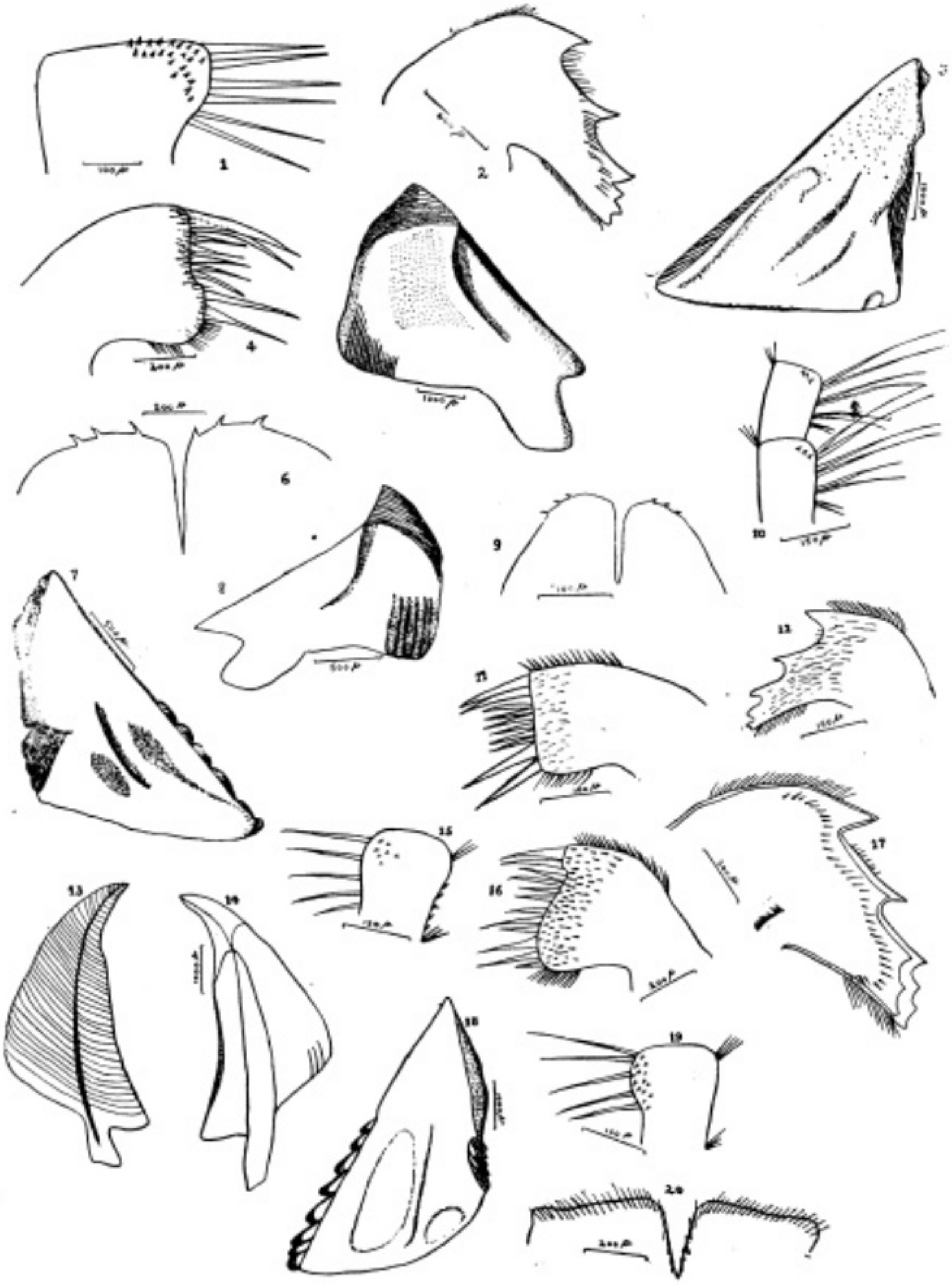


PLATE VI.

Balanus balanoides Linnè—Figs. 1—10.

Fig. 1 Tergum—external view.
,, 2 Tergum—inner view.
,, 3 Scutum—inner view.
,, 4 Penis.
,, 5 Entire animal.
,, 6 First cirrus.
,, 7 Second cirrus.
,, 8 Mandible.
,, 9 Labrum.
,, 10 Maxilla I.

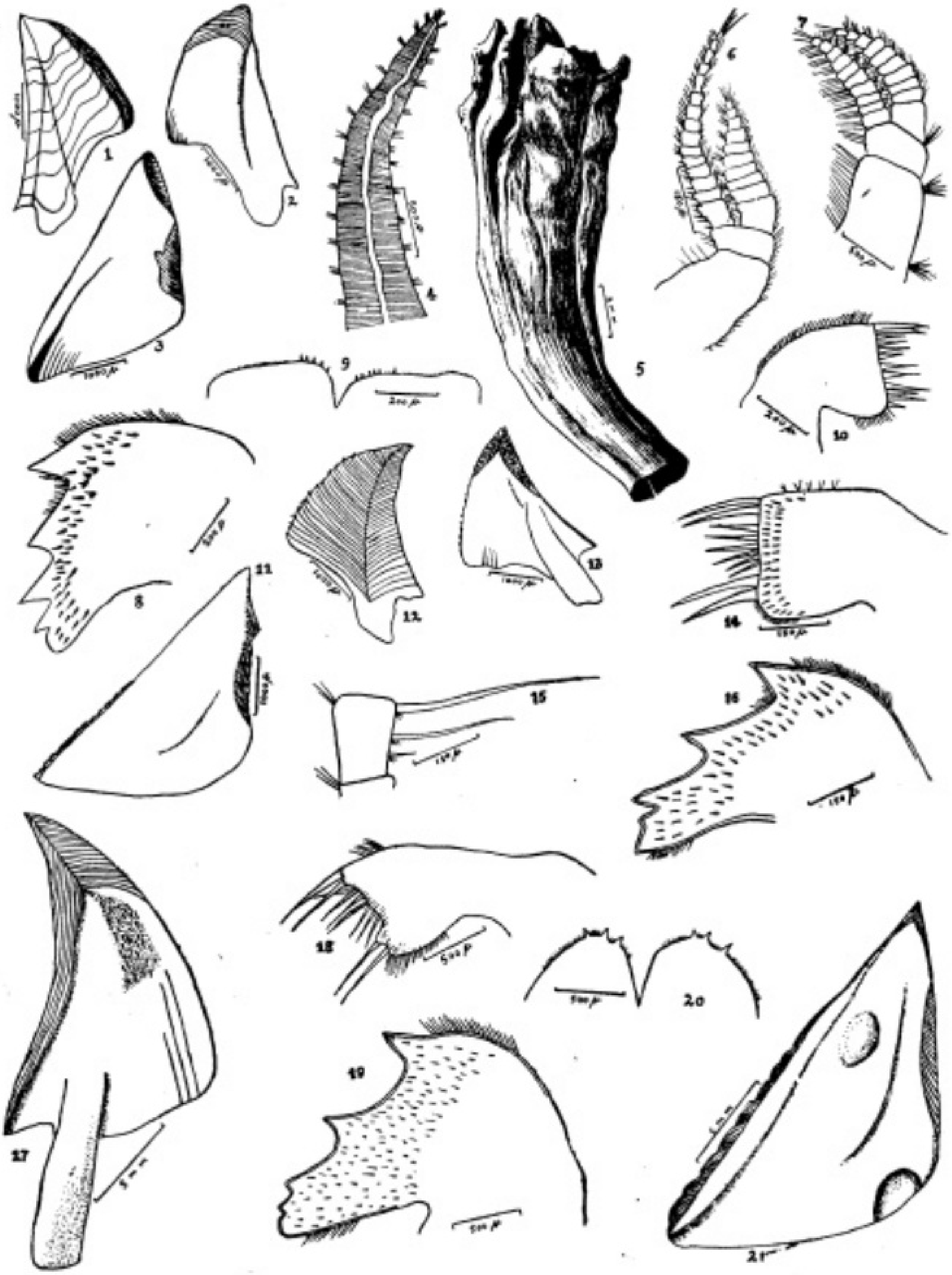
Balanus tenuis Hoek—Figs. 11—16.

Fig. 11 Scutum—inner view.
,, 12 Tergum—outer view.
,, 13 Tergum—inner view.
,, 14 Maxilla I.
,, 15 Single segment of fourth cirrus.
,, 16 Mandible.

Balanus amaryllis forma *euamaryllis* Broch—Figs. 17—21.

Fig. 17 Tergum—inner view.
,, 18 Maxilla I.
,, 19 Mandible.
,, 20 Labrum.
,, 21 Scutum—inner view

PLATE VI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5 mm

PLATE VII.

Balanus amaryllis forma *nivea* Gruvel—Figs. 1—2.

Fig. 1 Tergum—internal view.
,, 2 Tergum—external view.

Balanus longirostrum Hock—Figs. 3—10.

Fig. 3 Entire animal.
,, 4 Tergum—inner view.
,, 5 Fourth cirrus.
,, 6 First cirrus.
,, 7 Mandible.
,, 8 Scutum.
,, 9 Maxilla I.
,, 10 Labrum.

Balanus calceolus Darwin—Figs. 11—16.

Fig. 11 Entire animal.
,, 12 Scutum—inner view.
,, 13 Tergum—inner view.
,, 14 Maxilla I.
,, 15 Single segment.
,, 16 Labrum.

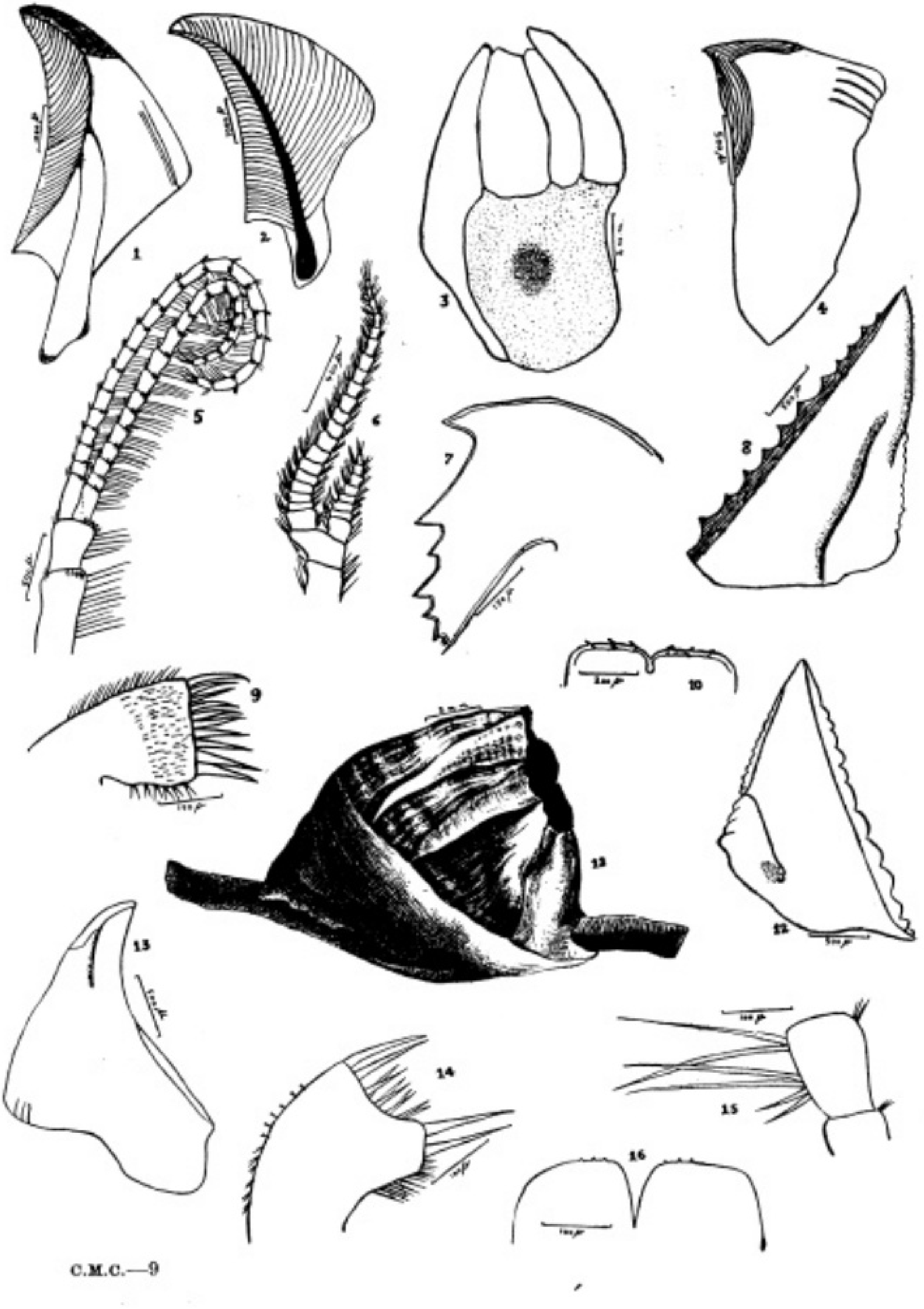


PLATE VIII.

Balanus cymbiformis Darwin—Figs. 1—6.

Fig. 1 Tergum—inner view.
,, 2 Entire animal.
,, 3 First cirrus.
,, 4 Scutum—inner view.
,, 5 Mandible.
,, 6 Single segment.

Acasta sulcata Lamarck—Figs. 7—14.

Fig. 7 Tergum—inner view.
,, 8 Entire animal.
,, 9 Fourth cirrus.
,, 10 First cirrus.
,, 11 Mandible.
,, 12 Maxilla I.
,, 13 Scutum.
,, 14 Labrum.

PLATE VIII

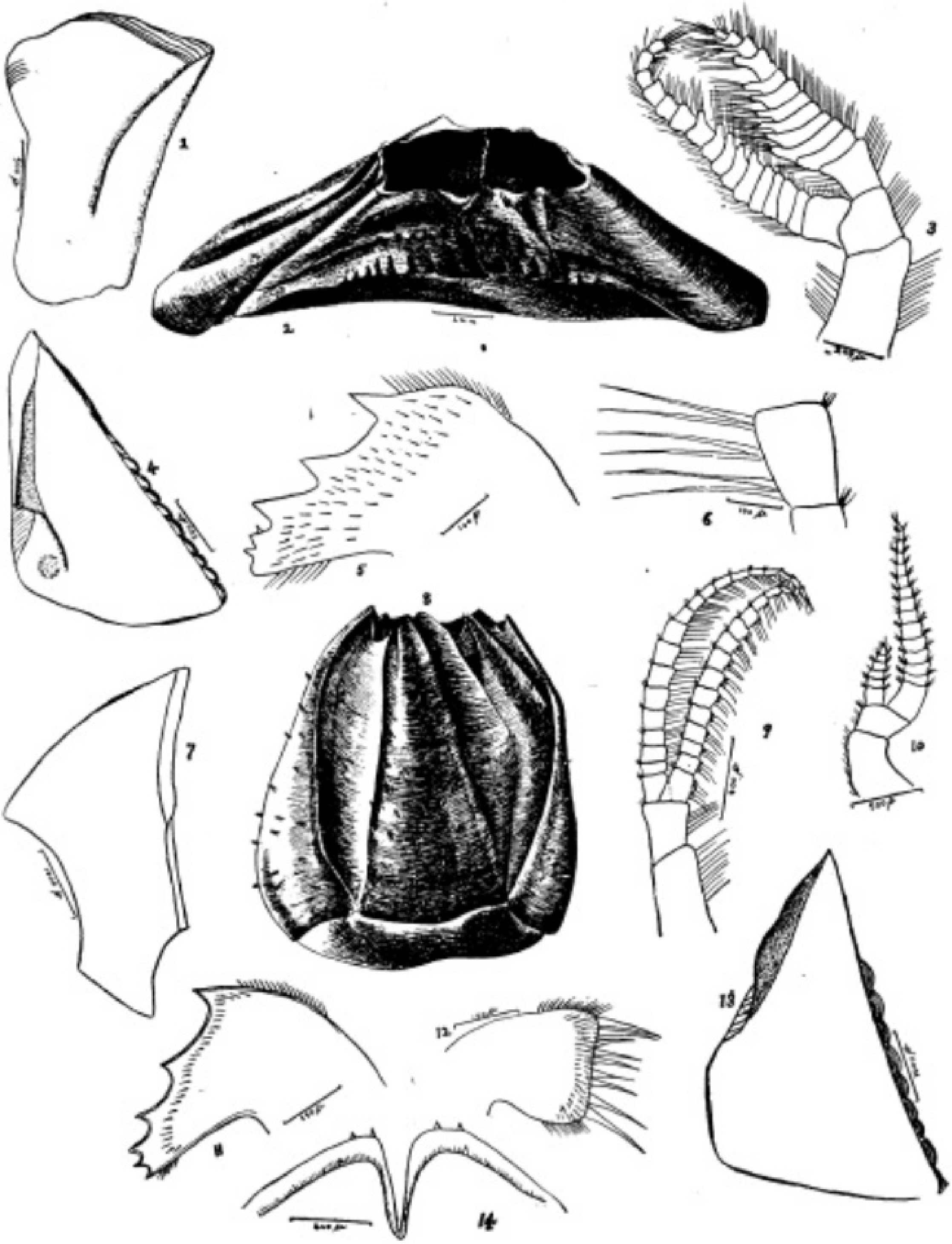


PLATE IX.

Tetraclita purpurascens Wood—Figs. 1—5.

Fig. 1 Opercular valves.
,, 2 Maxilla I.
,, 3 Mandible.
,, 4 Single segment.
,, 5 Labrum.

Chelonobia testudinaria Linnè—Figs. 6—9.

Fig. 6 Entire animal.
,, 7 Mandible.
,, 8 Maxilla I.
,, 9 Labrum.

Chelonobia caretta (Spengler)—Fig. 10.

Fig. 10 Entire animal.

Chelonobia patula Ranzani—Fig. 11.

Fig. 11 Entire animal.

Platylepas hexastylos Fabricius—Figs. 12—17.

Fig. 12 Labrum.
,, 13 Opercular valves.
,, 14 Maxilla I.
,, 15 Mandible.
,, 16 Entire animal.
,, 17 First cirrus.

PLATE IX

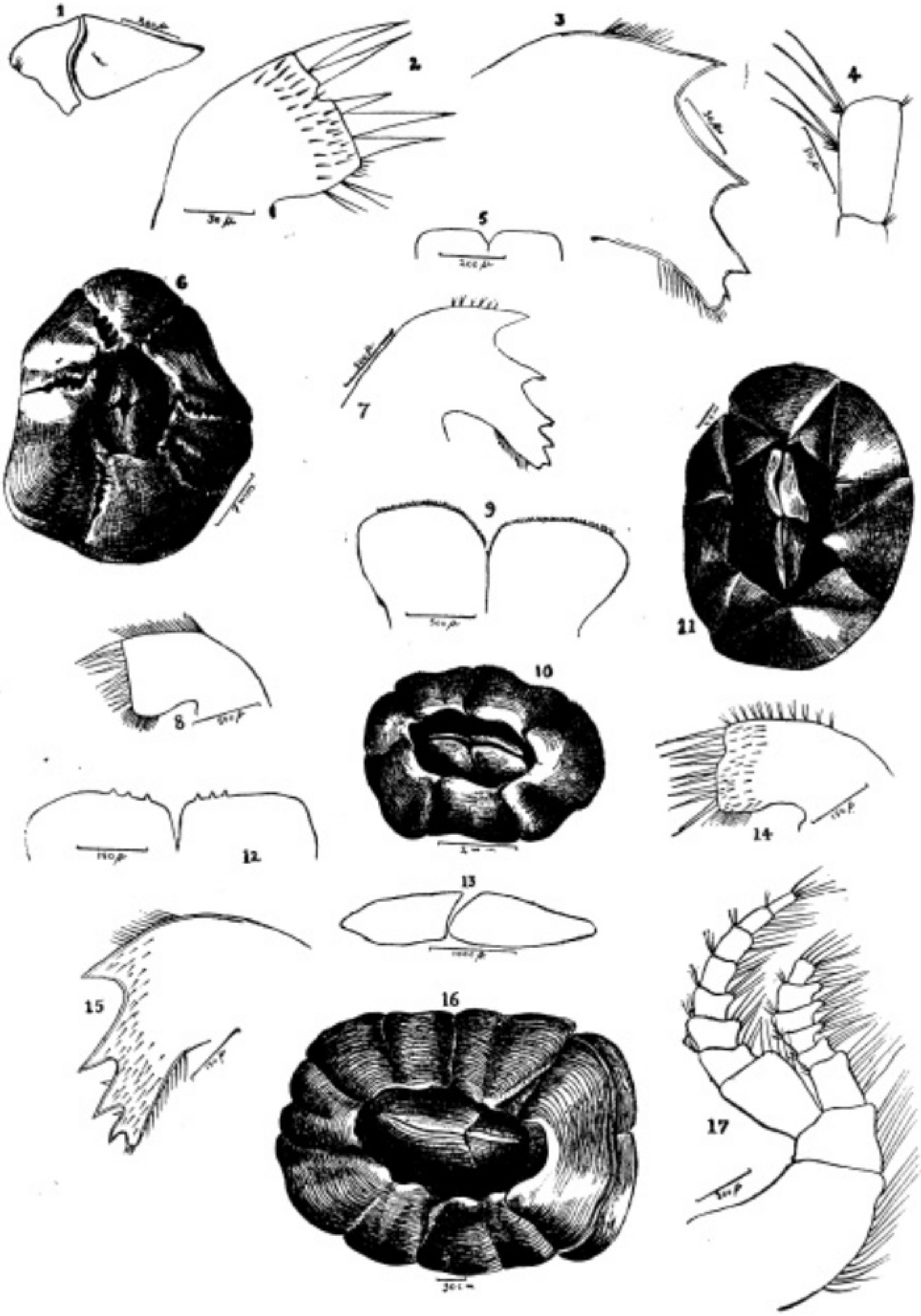
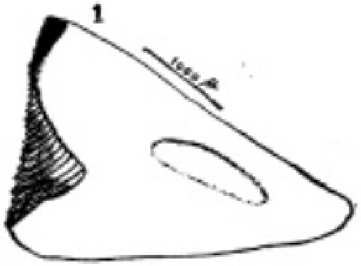


PLATE X.

Chthamalus stellatus stellatus Poli—Figs. 1—12.

Fig. 1 Scutum—inner view.
,, 2 Entire animal.
,, 3 First cirrus.
,, 4 Second cirrus.
,, 5 Mandible.
,, 6 Maxilla I.
,, 7 Single pectinated spine of terminal segment of second cirrus.
,, 8 Tergum—inner view.
,, 9 Tergum—outer view.
,, 10 Single segment of sixth cirrus.
,, 11 Labrum.
,, 12 Maxilla II.

1


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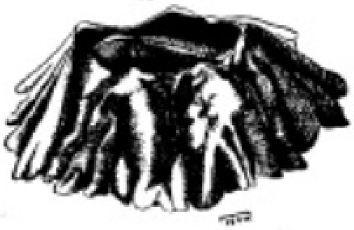

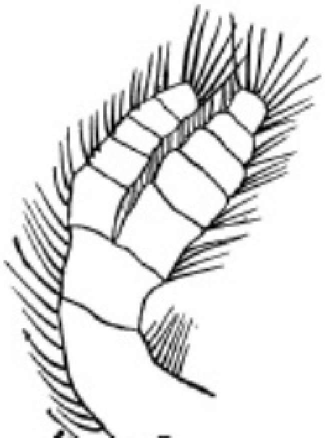

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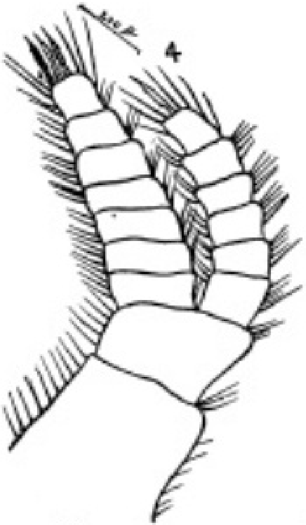

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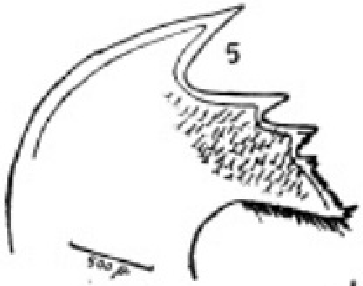

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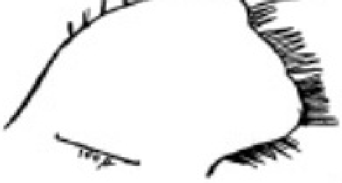

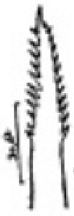
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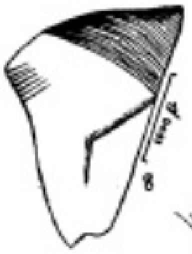

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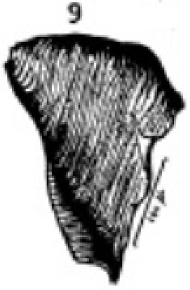

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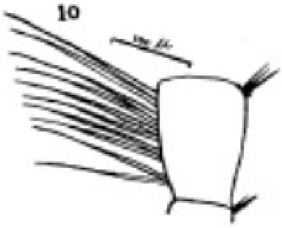

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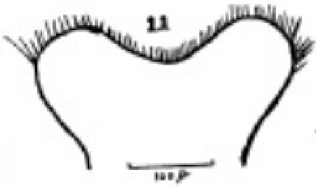

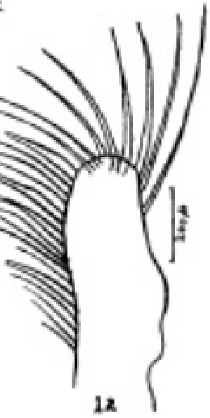

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